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THE ELECTRIC LIGHT CONVENTION.

Success in large letters is written all over the convention of the National Electric Light Association, held this week in Washington, and still in progress when our report closed. Just what the total attendance may be cannot be stated, but a registration in the vicinity of 1500 tells the story of continued interest, vitality and usefulness. There is so much in Washington worth seeing, a convention there can hardly fail, but the programme presented by the Association officers this year "needed no bush," and was sufficient in itself to attract in large numbers representatives of every branch of the central station industry and of the manufacturing concerns dependent upon it for their prosperity. As a matter of fact, the programme submitted for discussion this year was of almost redundant copiousness. It reminded one of the old puzzle of thinking of a number and doubling it. The management thought of available topics and doubled them, with the result of revealing the infinite richness of the field of experience and exploitation that the art now embraces. It remains open to question whether this plan stimulates discussion or checks it. When a programme is full there is an inevitable tendency to choke off discussion so as to get at the next item, and there were signs of this at Washington during the week, in a manner that our abstract cannot reveal, but to an extent that the printed transactions will bear testimony quite striking. We prefer to record the flash and fire of a sharp controversy, or even the less vivid expression of experience, as compared with the humdrum perusal of proof and manuscript. A convention is in reality a forum, and too much care cannot be paid to the stimulation of the intellectual exercise of discussion wherein a man often reveals his own knowledge to himself, not less than to others, under the stress of debate. Aside from this and one or two other points, the Washington convention with its earnestness and zeal, its influential representation from all parts of the Union, and its exhibit of many novel and valuable appliances, passes into history as one of the best meetings the Association has ever had. President Williams and his colleagues are to be heartily congratulated. Elsewhere we print a report of the proceedings of the convention up to Wednesday noon.

THE METALLIC OXIDE ARC.

Mr. Little's convention paper is devoted to the description of a type of electric arc that has many valuable and striking properties. The magnetite arc is the most familiar example of the class, but it is now very generally understood that this is in fair way to be superseded by improved forms containing titanium oxide and other substances. The ordinary flaming arc, of which the electrodes are loaded with calcium fluoride or analogous fluorides, is enormously efficient, but its very efficiency depends on the production of a mass of incandescent vapor that requires a considerable amount of material for its sustenance. The metallic oxide arc works on much the same principle, but

the denser electrodes waste away far less rapidly and the distribution of light from the somewhat smaller flame is better suited to street lighting. Also, the positive electrode is of solid metal, so that the waste in it is of small account. The efficiency of such an arc does not at all equal that of the arc with more volatile electrodes, so far as mean spherical candle-power per watt goes, yet it is still high, and the cost of trimming is abnoramlly low, so that practically the results are excellent. It is rather interesting to note how at this point the faults of the ordinary enclosed arc are suddenly brought to the surface. To quote from Mr. Little, "The uniform white color of the metallic arc is in marked contrast to the changeable blue and white of the enclosed carbon arc."

Now, for some years past those interested in exploiting the enclosed arc have talked industriously of its admirable color value—so like daylight—unexcelled for matching fabrics, etc., etc. The cold-blooded technician has perfectly well understood that the enclosed arc gets so large a proportion of its light from the pale violet of the arc-stream that, save with currents larger than those generally used, it shows only fitful glimpses of anything resembling white, but his protests have been drowned by the joyous chorus of salesmen. Now a new light has dawned and we shall presently have promulgated a new and verbose definition of white that will leave the world wondering whether it really is Tyrian purple or pale cerise. But certainly almost anything will improve the color situation, and the hue of the new arcs is altogether pleasant to the eye. Just how rapidly and how far the metallic oxide arc will come into use it is difficult to say, for much depends on the success with which the apparently inevitable smudge is controlled. According to Mr. Little's paper good progress in this direction is being made. The faults he mentions, chiefly due to the soot referred to and the production of slag, are grave ones unless they can be so completely eliminated as to disappear from commercial practice. This we hope will soon be done, for the new arc with its long life of electrodes and strong outward distribution of the light has very conspicuous merits for street lighting, which seems the especial field of the arc. For indoor illumination the new incandescents may perhaps render arcs needless, especially if the Helion lamp with its comparatively substantial filament, is put into practical shape. The new arc seems to have a mechanism that is exceptionally simple. The really serious problem to be solved is the suppression of the soot nuisance, which natural draft may prove incapable of accomplishing in all weathers. Failing this, the result may be the evolution of an electrode giving less dark soot even at the expense of moderately frequent trimming. An electrode life of 150 hours or more is desirable, but not at all necessary to commercial success.

The Ratio of Light to Heat in Incandescent Lamps.

In January last the *Physikalische Zeitschrift* published the results of an experimental research by Herr J. Russner on the luminous efficiency of incandescent lamps; or the percentage of their total radiation appearing in light. The results were abstracted in our Digest of March 16, and were also referred to editorially in that issue. The same journal in a more recent number has published a short article by Herr W. Voege in which Russner's results are criticized in detail. It is pointed out that the luminous efficiency of any incandescent lamp depends intimately upon the temperature of the filament, and also, therefore, upon the specific consumption in watts per candle. According to the data contained in Herr Voege's article, an incandescent lamp consuming 3 watts per mean horizontal Hefner (3.4 watts per U. S. candle-power), gives 0.2 watt in light, or has a luminous efficiency of 6⅔ per cent. As these results were presumably obtained with ordinary carbon filaments, they seem unduly favorable. The large differences between the results of different experimenters, in regard to the luminous efficiency of lamps, manifest the difficulty of the investigation. The difficulty is of two kinds. In the first place, we need to immerse the lamp in two different solutions successively. One solution should be absolutely opaque to non-luminous radiation and absolutely transparent to luminous radiation. The other should be either absolutely opaque to all radiation; or at least absolutely opaque to luminous radiation, but transparent to non-luminous radiation. No such ideal solutions have been found and their discovery is unlikely. Consequently, the complete separation of the luminous radiation from the non-luminous radiation is very difficult.

In the second place, the human eye responds differently to luminous stimuli of different colors. Beams containing one watt of red, yellow and blue light, respectively, affect the eye differently, the watt of yellow radiation producing considerably more sensation of light than the watt of either red or of blue light. Consequently, any statement of luminous efficiency can, in general, only apply to the particular spectrum analysis of the light considered. Properly speaking, luminous efficiency applies to each wave-length of light taken separately, and then the luminous efficiency of a composite beam of different wave lengths is an average depending not only upon the number of different wave-lengths present, but also upon their relative intensities. Meanwhile, in the midst of this complexity due to the interaction of electromagnetic waves falling on the retina, with their physiological stimuli and mental sensation, let us comfort ourselves with the reflection that all electric lamps yet produced have a low luminous efficiency, and that we ought to get much more light out of a watt than we actually do. The coming tungsten incandescent lamp will enable us to secure about three times more light from one watt of electric power than was formerly practicable with carbon incandescent lamps, but the perfect ideal lamp would give us far more.

Lightning Protection.

The report of the N. E. L. A. committee upon this subject is, as has usually been the case, interesting and inconclusive. Jove's bolts seem to fall alike upon the righteous and unrighteous—upon those fully equipped with the latest protective devices and those who have pinned their faith upon old-time apparatus and trusted to fortune. It takes the wiles of a professional statistician to extract from the data published much that is either for or against any particular device. For example, the lightning arresters were grouped in five divisions: Westinghouse, General Electric, Stanley, Garton-Daniels, and miscellaneous, and the results from these are practically indistinguishable when one compares the stations suffering serious

loss (C) with those practically immune (A). About 60 per cent of all the stations were in the first-mentioned class in spite of all appliances. The information regarding auxiliary devices is similarly inconclusive. For instance, 74 stations used choke-coils, and 52 of them fell into class C. On the other hand, 81 companies used no choke-coils, and of these 39 were in the same unhappy category. It is hardly safe to draw the conclusion that choke-coils are injurious, but rather that as systems run the choke-coils may have played in bad luck.

Similar reasoning may fairly apply to the use of grounded guard wires on transmission lines, imagined by some theorists to be a sort of panacea for all the troubles that the atmosphere is heir to. Of 18 companies which used such guard wires, 13 had serious trouble from lightning and but 4 were entirely immune. Of the 151 plants which did not use guard wires, 107 were in class C. The committee rather favors the use of guard wires when properly installed, and some favorable results are reported; but the protection afforded seems, on the face of the figures, to be far from complete, although the guard wire is not generally installed except in locations where trouble is looked for. One very interesting feature of the statistics is that of the 36 plants operating at above 30,000 volts only 19 were in class C, the group as a whole, therefore, showing a higher degree of safety than the lower voltage systems. This is doubtless due to two causes—the greater care taken in installing protective devices on important transmission lines, and to the fact that the actual insulation of such lines with their apparatus is exceptionally high, so that minor discharges fully capable of damaging ordinary circuits are rendered harmless. A system with a margin of safety of, say, 50,000 volts above its working pressure will withstand strains that would break down an ordinary 2300-volt system practically every time, and would be almost as fatal to lines at 5000 to 10,000 volts. In fact, out of 13 transmission systems in the 6600-volt class, 12 were in class C. As a whole, the report shows plainly that lightning protection even by the best appliances is still far from complete. The plants which reported showed in the aggregate 541 interruptions of service, a little more than 3 per plant, and nearer five for the plants which bore the brunt of the injuries. The casualty list included 483 lightning arresters, 505 transformers, 1126 meters and 23 generators. Truly there is still room for improvement, which we hope will be soon forthcoming.

Convention of German Electrical Engineers.

The *Elektrotechnische Zeitschrift* for the 16th of May announces the programme of the German Verband convention at Hamburg June 5-9, and a number of interesting titles of forthcoming papers are appended. It is noteworthy that in the United States conventions elaborately avoid Sundays. It is not quite respectable to convene on a Sunday. In fact, only of recent years has it been considered respectable to go to a museum or picture gallery on that day, the theory being that each individual is too much taken up by devotional exercises to have any time for gatherings in art, science or literature. Our German cousins set us a meritorious, or at least a wholesome, example by including a Sunday in their electrical engineering convention, apparently for the good reason that Sunday comes next to Saturday. All hands are called to take an all-day trip to Heligoland and back, a journey of several hours' ordinary steaming. The papers, reports and general business are scheduled as being all completed on Saturday, so that a Sunday ocean trip to blow away the smoke of the convention's combustion seems a most felicitous idea to countrymen who, like ourselves, know so well how to be lonely and desolate on Sundays. We hope that our German friends have not patented the invention of a convention which includes a Sunday.

Report of the Standardization Committees of the German Electrical Engineers.

Three subjects occupy special reports from committees. One refers to the safe carrying capacity of insulated wires, a second to symbols for indicating electrical machinery and apparatus on plans, and a third to standard dimensions for cables and wires. In regard to the safe carrying capacity of insulated wires, a new table is presented of the maximum current strength for a temperature elevation of 10 degrees C. in insulated copper wires. The size of the wires is given in square millimeters of cross-sectional area. The capacity of fuses for the protection of these wires is taken as 80 per cent of the maximum current strength for sizes above 3 sq. mm. In sizes of 2.5 sq. mm. and less, the capacity of the fuses is taken as 70 per cent of the maximum current. In regard to symbols, an extensive table has been prepared, and many of the designs are dissimilar to those in general use in this country. A minority of the designs, however, resemble those in use here, and all of them are easily learned. They are useful on plans and drawings. About 60 appear in the table, in addition to many initial letters of significance.

With reference to the standardization of wires and cables, a list of dimensions is given for different sizes and types of insulated wire. There are certain advantages and certain disadvantages in this kind of standardization. Among advantages are that cables of standard size according to Verband rules can be readily kept in stock and ordered on short notice. This saves expense both to the manufacturer and to the purchaser. Among the disadvantages are that the stereotyping of cables tends to suppress design and invention. Freedom of design, whereby new processes and methods may be availed of for commercial purposes, is of great assistance in the development of an industry along technical lines. It is doubtful whether engineering bodies do well in prescribing the dimensions of wires, apparatus or machinery. If no progress can be looked for, if the last word has been spoken, and the highest construction level has been attained, then it is reasonable to fix the experience of the past in statutory sizes, for the sake of simplicity and uniformity. If, however, progress is going on, so that the best machine, apparatus, or wire of to-day may not be the best to make ten years from now, then it is better to leave the manufacturers unrestricted to choose their own restrictions, and assign merely specifications of tests and properties, rather than the dimensions by which those tests are to be met. In the one case, when improvement comes, it saves either material or labor. In the other case, improvement must either be not availed of, or the standard dimensions must be ignored.

The Rise of Illumination.

The keen interest of central station men in better illumination is in no wise better shown than by the papers which appeared at this convention. The subject is so big that it needs much time and space for proper consideration, and therefore brief papers can only treat small portions of the field. A very suggestive one is the discussion of efficiency by Mr. Norman. His classification of the desires of customers is very much to the point and we heartily agree with it save that we have found the brilliancy fiend who values illumination on the glare-per-dollar basis commoner than he would indicate. One of the most striking things apparent of late is the intrusion of the color difficulty in its most aggravated form, and this condition is one of the most annoying things that the illuminating engineer has to meet. And, by the way, we wish that Mr. Norman had credited his color table to the proper source. It is in point of fact the list compiled very long ago by the distinguished and centenarian chemist, Chevreul, who was for a long period at the head of the Gobelin Tapestry Works, with a few additions filled in by Mr. W. D'A. Ryan, who published the list as given. The data relate to light transmitted through colored glass, falling upon plain fabrics in simple colors mostly from natural dyestuffs. The effects produced by colored light falling upon fabrics dyed with some of the modern "aniline" colors are still more bizarre than those given in the table.

Mr. Norman gives some excellent experimental data and suggestions for the use of various lights, which cannot fail to be of interest to those planning illumination. But, as he very truly says, illuminating engineering is a series of special problems, and to tell the truth these problems generally have their source far back of the present customer. Illuminating engineering work ought to begin before the final plants are drawn for a building, and it is the owner and the architect, not the lessee and the central station man, who should wrestle with the lighting difficulty. Architecture in past times, of which architecture in present times is generally a more or less slavish copy, was based wholly upon the effects to be produced in daylight, since artificial light was too ineffective to have much more than a slight decorative value. To-day buildings are, or ought to be, designed with some reference to the night-effects and the use of artificial light, since the modern city rouses to new activity long hours after the mediæval city was sound asleep, the only noise in its streets being the call of the nightwatchman and the only light his horn lantern. In old times such a proceeding as the systematic use of artificial light for industrial purposes was scarcely known, and the provisions for lighting were, if at all beyond the simple candle-stick or oil lamp, designed mainly for decorative purposes. This precedent has been the cause of a great deal of inadequate lighting, and its malign influence still persists. It is not necessary that modern illumination should be inartistic, but it is necessary that it should be effective. The use of artificial light has become altogether too important to be subordinated to a slavish and silly desire to imitate fittings of the Louis Quatorze or some other out-of-date period in the alleged interest of art. It is entirely possible to get good illumination from artistic and beautiful fixtures, but in modern life it is the illumination that is fundamentally necessary, and to obtain it efficiently requires tact and skill infinitely beyond the mere art of fixture design.

Irrigation Dams and Hydro-Electric Power.

The dam which the U. S. Government is undertaking to have erected across the Salt River in Arizona is to be of colossal proportions and to have a total height from foundation to parapet of 285 ft. This will create a lake 25 miles long and one to two miles wide, and the reservoir thus produced will be the largest artificial reservoir in the world. The reservoir is for regulating the supply of irrigating water to a desert land area of about 250 square miles in Arizona near Phœnix. A description of the project appears in the *Journal* of the Franklin Institute for April, 1907. The modern development of irrigating reservoirs, is almost invariably accompanied by hydro-electric power plants to utilize the fall of the stored water. A notable example of this is the large Assouan dam and reservoir of the Nile valley. In the case of the Roosevelt dam, it is designed to use 900 kilowatts in connection with the work of building, and three hydro-electric units of 300 kilowatts each are to be installed. Ultimately, the water is to be discharged at a distance beyond the dam under a head of 220 ft. with a corresponding increase in the power developed. It is clear that hydraulic engineering is calling for a closer connection with electrical engineering, not only in process of construction, but also in the utilization of water.

Evolution of Meter Testing.

Methods of customers' meter testing by central stations have gone through much the same evolution and improvement as other central station apparatus and methods. The improvement is partially due to improvement in instruments and partially to improvement in apparatus. First came the electrolytic meter used on direct-current circuits which required the weighing of plates at a central meter testing department each month. Following this was the commutator type of motor meter which remains to-day the only type generally used on direct-current circuits. While the motor type with the commutator was used at first on alternating-current circuits, it has been largely displaced by the induction type meters which require no commutator and consequently operate with far less attention than commutator types. Central station practice has been divided between testing of meters on customers' premises at regular intervals or taking down the meter and testing it at headquarters. Each method has its strong and weak points which it is not our purpose to discuss here. We wish rather to call attention to the changes that are going on in methods of testing on the customer's premises. Until very recently there were two common methods, or perhaps we should say, one common and one uncommon method of testing meters in place. One was to go out with indicating instruments and a stop watch and connect these indicating instruments in circuit, using the stop watch to give the time factor. In early days this meant carrying an ammeter and a voltmeter. Later progress in instrument making simplified this to an indicating wattmeter. Although not absolutely essential, it was quite common to send two men together for checking meters in this way. The other method used by a limited number of central station companies was to fix up some of the standard sizes of customers' meters in such shape that they could be used as portable testing instruments. Then instead of using an indicating wattmeter and a stop watch, one of these portable integrating meters was connected in circuit so that the meter tester, had

simply to compare the readings of the meter test and the one used as a standard. The standard portable meters would be checked frequently at the central station.

Recent progress in watt-hour meter manufacture has made available watt-hour meters in cases that can be readily carried about by one man and with dials indicating the number of revolutions so that very accurate readings can be obtained in a very short time. By connecting these in circuit with the customer's meter a direct comparison is obtained without bothering with the stop watch, just as in the older method of testing by means of ordinary customers' wattmeters fixed up for portable use. Much closer and more accurate readings can be obtained from the portable master meters and they can be used to test a larger number of sizes of customers' meters than could an ordinary whatt-hour meter fixed up as a portable instrument. They have also the advantage that they can be carried by one man, and in fact the whole work of checking a customer's meter can be done by one man, doing away with annoyance to customers through having two men on the premises when checking meters and saving some in meter testing labor. The saving in labor is not, however, 50 per cent over the old method, as might be supposed, since one man cannot test as many meters a day as would two men under the older method. He can, however, test more than half as many. In one station two men formerly averaged 20 meters per day. One man now averages 12 or 13.

It is also gratifying to note the performance of some of the modern types of induction meters when placed in favorable locations on customers' lines. With commutator types of meters and with some of the earlier induction meters, it was considered good practice to test customers' at intervals of six to twelve months. The experience of a number of central stations with the best induction types of meters seems to indicate that it is not necessary to test them oftener than once in two years, and that perhaps even this figure may safely be increased since the errors are small after two or three years' service. This means, of course, a great saving in the cost of meter testing as well as in losses of revenue due to slow meters.

CARBON-FILAMENT LAMP LIFE ON VARYING VOLTAGES.

In the early days of the incandescent lamp it was established that the duration of a carbon filament varies according to an approximate law, namely, that the life is inversely proportional to the nth power of the candle-power, the value of n with lamps of the period having been found to be 3.65. In the discussion on a recent British I. E. E. paper by Mr. C. Patterson on "Light Standards and the High-Voltage Glow Lamp," Mr. Irwin Howell stated that life tests on ordinary carbon filament lamps carried out by the General Electric Company at Harrison, N. J., have given a value to the exponent of 3.65, there thus being no change from the earlier lamps. This value indicates that with 1 per cent increase in candle-power the probable lifetime of the lamp would be diminished 3.65 per cent. But 1 per cent increase in voltage usually increases the candle-power about 5.5 per cent, so that this 1 per cent in voltage is accompanied by a probable reduction of life amounting to about 16 per cent. According to this rule, which ought to be more generally noticed, if a lamp is burned at 50 per cent below its rated candle-power, its lifetime is likely to be prolonged 12½ times. If, however, it be burned at 50 per cent above its rated candle-power its probable lifetime will be reduced 77.5 per cent.

Some data for standard 200-volt 16-cp lamps when running at voltages between 10 per cent high and 10 per cent low were contributed by Mr. C. Wilson. These figures agree moderately well with the above-mentioned rule, the exponent varying between 2.65 and 4.4 in different entries. The exponent of 3.65 would fairly represent a mean value of the data given. It will be very interesting to ascertain whether the mortality exponent of candle-power — 3.65, as found for ordinary carbon filaments applies to "gem" filaments, and also whether it is applicable in any way to tantalum, osmium and tungsten filaments. It would seem unlikely that the mortality exponent should be the same on different types of filament. The measurement is, however, exceedingly tedious and expensive to make, and care must be exercised that only lamps of normal rating are used. It is not sufficient to run a couple of lamps on a given voltage until they break. In order to secure reliable results some fifty lamps of uniformly normal voltage must be burned together, under the same conditions, so as to obtain a reliable average lifetime. In the case of lamps overrun, the lifetime is relatively short, and the delay in the observation only lasts a few days or weeks; but when the lamps are underrun the test drags out almost interminably. The cost of such a test under reliable conditions is, therefore, very heavy, both in time and in energy consumed.

A long discussion appears to have taken place at the meeting over the relative advantage of pentane and hefner standard flames. The history of the subject was well summarized by Mr. A. P. Trotter, who has himself contributed to the subject. He pointed out that although an immense aggregate amount of experimental work had been done in seeking for improved primary luminous sources, nothing had been found superior to the Hefner standard lamp. The Hefner has been adopted as the primary standard of Germany and also by the United States in a tentative manner. The accuracy of reproducing the Hefner is, however, considerably less than that of calibrating and reproducing secondary standards in the form of incandescent lamps. It is, therefore, very undesirable that the Hefner should be regarded as a suitable commercial or factory standard. The Hefner should only be used as a primary standard in the principal laboratories of each country and secondary standard incandescent lamps of suitable age and specific consumption should be dispensed by these laboratories as commercial standards. If the Hefner lamp could be adopted as an international primary standard, in lieu of a better which gives no promise of appearing, we might expect to have secondary incandescent lamps prepared by international agreement from the Hefner, in such a manner that it would be impossible for the various civilized countries to differ from each other in secondary standard hefners by more than 1 per cent. Under these conditions the candle-power of each country's lamps could be locally measured and determined by the use of local multipliers or reference ratios with respect to the hefner. In the United States, for instance, the ratio between the hefner and the candle-power is taken as 88 per cent, though more recent determinations place the value higher. At present we are really dependent upon this process in an unofficial way.

The Washington Convention.

The thirtieth convention of the National Electric Light Association began at the Hotel Willard, Washington, on June 3 and continued through the week until Friday. For few of its meetings has the association made such careful and elaborate preparations, and the result was seen in a corresponding smoothness and celerity in all that pertained to its work and play. The general and reception committees performed all their duties with conscientious exactness, and President Williams had given to all the plans a close supervision that did much to ensure the brilliant success of the convention as a whole. The weather while mild was not all of it of the best, but one has ceased to predicate continuous sunshine for 1907, and for the bulk of those in attendance the extraordinarily full and comprehensive programme left scant leisure for the not less abundant entertainment subject to marring by wind and rain. Fortunately in a convention city, the association had the town pretty much to itself, although there was a quaint mingling of badges owing to the unveiling of the Jefferson Davis monument at Richmond, from which point many southerners went on to Washington in all their regalia, and often in faded uniforms of the regiments of long ago. The effect of the mixture was at times startling. The buttons and badges had to be scanned, to make sure, especially at the Willard, where there thus came all the time a reminder of the way in which both South and North had united to turn the weapons into the instruments of peaceful industry and had thus achieved a social and economic development, unsurpassed in history. In no part of the country to-day is electrical and power development more rapid than in those states from which came these picturesque veterans, participants in the bitter struggle of the past.

As usual, the members focalized from all points of the compass A large contingent arrived from New York at 2:30 p. m. on Monday, over the Baltimore & Ohio, under the care of Mr. George F. Porter, master of transportation. This party mustered nearly 170, and would have been over 200 but for the storm at starting which caused over 40 to wait for later trains, selfish to that extent in belating a train that could have made schedule time with one car less to haul. Mr. Porter has been conducting convention tours personally ever since he left college, and the ingrained habit knows no cure. A large proportion of the travelers were from central stations in New England and New York State.

A special six-car train left Chicago over the Pennsylvania Railroad at 3 p. m. Sunday, arriving in Washington about 2:15 Monday afternoon. This train carried over 60 to the convention, a large percentage being central station men. The trip was a very pleasant one and as usual the special train feature added considerable to the practical value of the convention for those taking it because of the opportunity to compare notes and renew acquaintances that such a train affords on a long run. The exhibit of apparatus in the banquet room of the Willard, noted in detail elsewhere, constituted a brilliant and successful part of the meeting but was subject to very severe limitations of space and was criticized in some quarters because the display was not open to the general public as on many other occasions. On the other hand, the concentration of all the business of the convention under one roof and within narrow space, subserved very materially the comfort and convenience of the members, and saved time to an inconceivable extent. The opening on Monday night of the exhibit was followed by a reception, at which music was furnished by the band of the U. S. Marine Corps. On Tuesday morning an automobile ride was given to the ladies, for two hours, around Washington. In the afternoon, a reception was given by the President at the White House, when some 2000 patriotic citizens of both sexes hastened to shake the hand of the champion corporation tamer of the United States. This interesting function was followed by a theater party in the evening at the Columbia Theater. The arrangements for Wednesday included an automobile ride, and in the afternoon an exhibition drill of U. S. cavalry and field artillery at Fort Myers; with a lecture in the evening from Dr. C. P. Steinmetz by way of contrast. The entertainment programme for Thursday included a visit to the home of George Washington at Mount Vernon, and on Friday trips were made to the various departments and bureaus of interest in the city.

The local committee did all in its power to render these and the more serious functions agreeable and profitable. Special mention must be made of the indefatigable efforts of Gen. G. H. Harries, Messrs. E. S. Marlow, G. P. Mangen, Philander Betts, J. M. Stoddard, W. K. Handy, J. C. McLaughlin.

One of the most interesting features of the convention was the presence of Prof. Bovey, dean of the Faculty of Physics of McGill University, Montreal, where the association was royally entertained some 17 years ago, upon which occasion Prof. Bovey was presented with a phonograph and made an honorary member.

Elsewhere are printed abstracts of the papers presented on Tuesday and of their discussion, and a telegraphic report of the proceedings of Wednesday morning. The remaining papers and their discussion will be covered in the issue of next week.

Mechanical Engineers' Meeting at Indianapolis.

The spring meeting of the American Society of Mechanical Engineers was held at the Claypool Hotel, Indianapolis, Ind., May 28, 29, 30 and 31. The opening session was held on Tuesday evening and a welcoming address made by Mayor Bookwalter. The mayor referred to the large number of conventions held in Indianapolis, and that he and his people felt especially flattered at the presence of such a representation of mechanical genius. He spoke of the advancement that had been made in the mechanical world and said much of the wonderful development was due to mechanical engineering.

Prof. F. R. Hutton, president of the society, responded to the address of welcome and said the members of the society were already convinced they had made no mistake in coming to a city with so many attractions for the mechanical engineer, so many large plants to visit, and a city centrally located and the star city of the country in matters of interurban and steam railroad transportation. He spoke of the services to mankind of the mechanical engineer, the man who generated and produced things. An informal reception and luncheon followed and proved a very enjoyable occasion.

The Wednesday morning session was devoted to the reports of the secretary and of various committees and the transaction of new business. The afternoon session was occupied by the reading of the abstracts of papers on a number of important subjects. The plan of the society is to print all papers in advance, and the author of each paper reads the abstract and, where necessary, presents the illustrations preliminary to the discussion. For the most part the papers were technical and required blue prints, blackboard and stereopticon assistance to make them plain. Abstracts of papers were read on the following subjects: "Collapsing Pressures of Lap-welded Steel Tubes," by R. T. Stewart, of Allegheny, Pa.; "The Balancing of Pumping Engines," by A. F. Nagle, of Buffalo, N. Y., and "The Economy of the Long Kilns," by E. C. Soper, of South Pittsburg, Tenn.

During the evening session abstract of papers were read and illustrated more or less on subjects as follows: "Ball Bearings," Henry Hess, of Philadelphia; "Air Cooling of Automobile Engines," by John Wilkinson, of the Franklin Automobile Works; "Materials for Automobiles," by Elwood M. Haines, of Kokomo; "Special Automobile Steel," by T. J. Fay, chief engineer of the Elsworth Automobile Company, of New York, and "Railway Motor Car," by B. D. Gray, of the American Locomotive Works, Providence, R. I.

Each of these abstracts and papers brought out lively discussion and numerous inquiries. Exhibits were furnished in explaining the subject matter of some of the papers.

The first paper read at the Thursday morning session was per-

haps of the greatest importance since it attracted a number of traction and electric light men. The subject was, "The Utilization of the Superheated Steam, or the Economy of Steam in Large Power Plants." This paper was presented by A. R. Dodge, of Schenectady, N. Y.

The concluding session of the meeting was held at Purdue University on Friday, to which the members had been conveyed at high speed by the Indianapolis & Northwestern Traction Company.

After a careful and enjoyable inspection of the mechanical equipment of the University and a luncheon, the members assembled in Fowler Hall and concluded the programme by the reading of abstracts of papers on the following subjects: "Experiences with Superheated Steam," by G. H. Barrus, of Boston; "Performance of Coal Superheaters," by Prof. Goss, of Purdue University; "Superheated Steam in the Injector," by S. L. Kreass, of Philadelphia; "Use of Superheated Steam on Locomotives," by H. H. Vaughan, of Montreal, and "Material for the Control of Superheated Steam," by M. W. Kellog, of New York.

During the meeting a number of excursions were made by electric train and automobiles for the inspection of prominent manufacturing and power plants.

The social features of the convention consisted of receptions, luncheons and a dance. There were many ladies—wives and daughters of the members—present.

The next meeting place will be selected by the executive committee, with a strong preference for Atlantic City.

Just-Hanaman Tungsten Lamp Patent.

A patent was issued May 28 on a division of an original application filed July 6, 1905, to Alexander Just and Franz Hanaman, of Budapest, on their method of making tungsten incandescent lamp filaments. The specification states that the process is known of converting carbon filaments into tungsten filaments by heating the former in an atmosphere of oxychlorides of tungsten in the presence of hydrogen, tungsten in the process replacing the carbon. Experience, however, has proved that in using a carbon filament as a starting body it is not possible to obtain pure tungsten filaments because of the fact that the inner core of the carbon filament remains influenced by the reactions occurring on the exterior of the filament, the result being that the inner part either only undergoes alteration in a slight degree or remains wholly unaltered.

According to the present invention, the process is started with bodies consisting of a mixture of tungsten and carbon or of compounds thereof, whereby it becomes not only possible to obtain finally pure tungsten filaments, but the duration of manufacture is considerably decreased and much facilitated. Finely divided tungsten or some tungsten compound which is readily reduced by carbon to a metal, such as tungsten oxide, tungstic acid, tungsten sulphide, or the like, is mixed with an organic binding medium, such as a solution of cellulose in chloride of zinc, collodion, coal tar, or the like; the filaments are then being formed by pressure in the usual manner, and thereafter (following a denitration in case collodion is applied), the filaments are carbonized. The quantity of tungsten compound employed in the mixture is such that in the finished filament sufficient carbon is always present to impart the necessary strength to it, as the filament depends upon the carbon alone for strength to withstand the subsequent treatment. Efficient filaments are obtained if from 2 to 10 grams of tungstic acid are added to a solution of 10 grams of cellulose in 260 grams of chloride of zinc having a specific weight of 1.83. This mixture is then formed into filaments and carbonized in the absence of air and then submitted to the following further treatment. An electric current is passed through the filament in an atmosphere of the vapor of one the oxyhalogon compounds of tungsten, such as tungsten oxychloride, in the presence of a little free hydrogen. When the filament incandesces a reaction occurs whereby the carbon still retained in the filament is replaced by tungsten.

The two claims of the patent are on a method of making incandescent bodies for electric lamps, which consists in producing the said bodies from a mixture of carbon and tungsten and replacing the former by tungsten; and for a method which consists in heating of carbon and tungsten to a red heat in the vapor of an oxyhydrogen compound of tungsten by an electric current in the presence of carbon, to cause the carbon to be replaced totally by tungsten.

Meeting of New York State Central Station Companies.

The Empire State Gas & Electric Association has invited all lighting companies in New York State to a general meeting to be held at Lake Champlain on June 27 under its auspices. The meeting has been called primarily to discuss provisions of the Public Utilities Bill and the methods employed in fixing the valuation of properties for the purpose of taxation. The passing of this bill by both the Assembly and the Senate and the decision of Referee Masten in the appeal of the Consolidated Gas Company from the 80-cent gas law, are two events of the greatest interest to the lighting companies of the state, and will be thoroughly discussed at the meeting.

Rules Governing the Installation of Theater Wiring.

The committee appointed at a meeting of the National Board of Fire Underwriters, held in New York in December, 1905, to consider the matter of theater wiring specifications recommended at the March, 1907, meeting, that "Rule 65A: Moving Picture Machines" be discontinued, and that the following suggested "Special Rules and Requirements for the Installation of Wires and Apparatus for Electric Light, Heat and Power in Theaters where potential of system does not exceed 250 volts" be adopted and incorporated in the "National Electric Code," the location and number of rule to be such as may be found advisable when rules are re-codified for the 1907 edition.

All wiring, apparatus, etc., not specially covered by special rules herein given must conform to the standard rules and requirements of the National Electrical Code.

In so far as these rules and requirements are concerned, the term "theater" shall mean a building or part of a building in which it is designed to make a presentation of dramatic, operatic or other performances or shows for the entertainment of spectators, which is capable of seating at least 400 persons, and which has a stage for such performances that can be used for scenery and other stage appliances.

(*a*). Services:

1. Where the source of supply is outside of building, there must be at least two separate and distinct services, and where practicable they must feed from separate street mains.

2. Where source of supply is an isolated plant within same building, an auxiliary service of at least sufficient capacity to supply all emergency lights must be installed from some outside source, or a suitable storage battery within the premises may be considered the equivalent of such service.

A fine print note explaining what is meant by "emergency lights" will be added.

(*b*). Stage:

1. All permanent construction on stage side of proscenium wall must be approved conduit with the exception of cables of border and switchboard wiring.

2. Switchboards.—Must be made of non-combustible, non-absorptive material, and where accessible from stage level, must be protected by an approved guard rail to prevent accidental contact with live parts on the board.

3. Footlights.—Must be wired conduit construction, each lamp receptacle being enclosed within an approved outlet box, the whole to be enclosed in an iron trough, metal to be of a thickness not less than No. 20 gauge, or each lamp receptacle

can be mounted on or in the cover of an iron box so constructed as to enclose all the wires and live parts of receptacles.

4. Borders:

a. Must be constructed of iron of a thickness not less than No. 20 gauge, treated to prevent oxidization, be suitably stayed and supported by a metal framework and so designed that flanges of reflectors will protect lamps.

b. Must be wired conduit construction, each lamp receptacle to be enclosed within an approved outlet box, the whole to be enclosed in an iron trough, or each lamp receptacle may be mounted on or in the cover of an iron box, so constructed as to enclose all the wires and the live parts of receptacles, metal to be of a thickness not less than No. 20 gauge.

c. Must be provided with suitable guards to prevent scenery or other combustible material coming in contact with lamps.

d. Cables must be continuous from stage switchboard to border, conduit construction must be used from switchboard to point where cables must be flexible to permit of the raising and lowering of border, and flexible portion must be enclosed in an approved fireproof hose or braid and be suitably supported.

Exception.—Junction boxes will be allowed on fly floor and rigging loft in existing theaters where the wiring has been completed and approved by Inspection Department having jurisdiction.

e. For the wiring of the border proper, wire with slow burning insulation should be used.

f. Must be suspended with wire rope, same to be insulated from border by at least two approved strain insulators properly inserted between.

5. Stage Pockets:

Must be of approved type controlled from the switchboard, each receptacle to be of no less than 50 amperes rating, each receptacle to be wired with a separate circuit to its full capacity and be controlled from the switchboard.

6. Proscenium Side Lights:

Must be so installed that they cannot interfere with the operation of or come in contact with curtain.

7. Scene Docks:

Where lamps are installed in scene docks, they must be so located and installed in such manner that they will not be liable to mechanical injury.

8. Curtain Motors:

Must be of iron-clad type and installed so as to conform to the standard rules and requirements of the National Electrical Code.

9. Control of Stage Flues:

a. In cases where dampers are released by an electric device, the electric circuit operating same must be normally closed.

b. Magnet operating damper must be wound to take full voltage of circuit by which it is supplied, using no resistance device, and must not heat more than normal for apparatus of similar construction. It must be located in loft above scenery and be installed in a suitable iron box with a tight, self-closing door.

c. Such dampers must be controlled by at least two standard single pole switches mounted within approved iron boxes, provided with self-closing doors without lock or latch and located one at the electrician's station and the others as designated by the Inspection Department having jurisdiction.

(*c*). Dressing Rooms:

1. Must be wired in approved conduit.

2. All pendant lights must be equipped with approved reinforced cord or cable.

3. All lamps must be provided with approved guards.

(*d*). Portable Equipments:

1. Arc lamps used for stage effects must conform to the following requirements:

a. Must be constructed entirely of metal, except where the use of approved insulating material is necessary.

b. Must be substantially constructed and so designed as to provide for proper ventilation and to prevent sparks being emitted from lamp when same is in operation, and mica must be used for frame insulation.

c. Front opening must be provided with a self-closing hinged door frame in which wire gauze or glass must be inserted, excepting lens lamps, where the front may be stationary and a solid door be provided on back or side.

d. Must be provided with a one-sixteenth iron or steel guard having a mesh not larger than 1 in., and be substantially placed over top and upper half of sides and back of lamp frame; this guard to be substantially riveted to frame of lamp, and to be placed at a distance of at least 2 ins. from the lamp frame.

e. Switch on standard must be so constructed that accidental contact with any live portion of same will be impossible.

f. All standard connections in lamp and at switch and rheostat must be provided with approved lugs.

This rule will be reworded so as to specify what is meant by "standard connections."

g. Rheostat, if mounted on standard, must be raised to a height of at least 3 ins. above floor line, and in addition to being properly enclosed must be surrounded with a substantially attached metal guard having a mesh not larger than 1 sq. in., which guard is to be kept at least 1 in. from outside frame of rheostat.

h. A competent man should be in charge of not more than two standards, 10 ft. apart and plainly in sight, provided that each contains one arc. Not more than two arc lamps should be mounted on one standard.

2. Bunches:

a. Must be substantially constructed of metal, and must not contain any exposed wiring.

b. The cable feeding same must be bushed in approved manner where passing through the metal, and must be properly secured to prevent any mechanical strain from coming on the connection.

3. Strips:

a. Must be constructed of iron of a thickness not less than No. 20 gauge, treated to prevent oxidization, and suitably stayed and supported by metal framework.

b. Cable feeding same must be bushed in an approved manner where passing through the metal, and must be properly secured to prevent any mechanical strain from coming on the connections.

4. Portable Plugging Boxes:

Must be constructed so that no current carrying part will be exposed, and each receptacle must be protected by approved fuses mounted on slate bases and enclosed in a fireproof cabinet equipped with self-closing doors. Each receptacle must be constructed to carry 30 amperes without undue heating, and the bus-bars must have a carrying capacity equivalent to the current required for the total number of receptacles, allowing 30 amperes to each receptacle, and approved lugs must be provided for the connection of the master cable.

5. Pin Plug Connectors:

a. When of approved type may be used to connect approved portable lights and appliances that do not require more than 660 watts.

b. Must be so installed that the "female" part of plug will be on the live end of cable and must be so constructed that tension on the cable will not cause any serious mechanical strain on the connections.

6. Lights on Scenery:

Where brackets are used they must be wired entirely on the inside, fixture stem must come through to the back of scenery and end of stem be properly bushed.

7. String or Festoon Lights:

Wiring for same should be approved cable, joints where taps are taken from same for lights to be properly made, soldered and taped, and where lamps are used in lanterns or similar devices lamps must be provided with approved guards. Where taps are taken from cable, they should be so staggered that joints of different polarity will not come immediately opposite each other and must be properly protected from strain.

8. Special Electrical Effects:

Where devices are used for producing special effects such as lightning, waterfalls, etc., the apparatus must be so constructed

and located that all flames, sparks, etc., resulting from the operation cannot come in contact with combustible material.

(*e*). Auditorium:

1. All wiring must be installed in approved conduit.

2. All fuses used in connection with lights illuminating all parts of the house used by the audience must be installed in fireproof enclosures, so constructed that there will be a space of at least 6 ins. between the fuses and the sides and face of enclosures.

3. All exits shall be plainly indicated by a sign at each, the face to be illuminated and bear the word "Exit," the letters of which must not be less than 4 ins. in height and there must not be more than one set of fuses in any "Exit" sign circuit between service fuses and sign.

4. Exit lamps and all lamps in halls, corridors or any other part of the building used by the audience, except the general auditorium lighting, must be fed independently of the stage lighting and must be controlled only from the lobby or other convenient place in the front of house.

5. Every portion of the theater devoted to the use or accommodation of the public, also all outlets leading to the streets and including all open courts, corridors, stairways, exits and emergency exit stairways, should be well and properly lighted during every performance and the same should remain lighted until the entire audience has left the premises.

Rule 65A. "Moving Picture Machines" was amended by substituting the following rule. A fine print note was inserted under "Theater Wiring" calling attention to this rule.

a. Arc lamp used as a part of moving picture machines must be constructed similar to arc lamps of theaters and wiring of same must not be of less capacity than No. 6 B. & S. gauge.

b. Rheostats must conform to rheostat requirements for theater arcs.

c. Top reel must be encased in an iron box with hole at the bottom only large enough for film to pass through, and cover so arranged that this hole can be instantly closed. No solder to be used in the construction of this box.

d. A steel box must be used for receiving the film after being shown with a hole in the top only large enough for the film to pass through freely, with a cover so arranged that this hole can be instantly closed. An opening may be placed at the side of the box to take the film out, with a door hung at the top, so arranged that it cannot be entirely opened, and provided with spring catch to lock it closed. No solder to be used in the construction of this box.

e. The handle or crank used in operating the machine must be secured to the spindle or shaft, so that there will be no liability of its coming off and allowing the film to stop in front of lamp.

f. A shutter must be placed in front of the condenser, arranged so as to be readily closed.

g. Extra films must be kept in metal box with tight-fitting cover.

h. Machines must be operated by hand (motor driven will not be permitted).

i. Picture machine must be placed in an enclosure or house made of suitable fireproof material, be thoroughly ventilated and large enough for operator to walk freely on either side of or back of machine.

To this rule was added a paragraph on the housing of the machine.

Telephony in Manitoba.

It is stated that the Manitoba Government is concluding a deal to take over the Bell Telephone Company's lines and exchanges in Winnipeg, Brandon and several other large towns. The government has been perfecting plans to build a system in Winnipeg and the Bell Company, convinced that the government meant business, decided to sell rather than engage in a rate war. It is stated that the company will keep its long distance lines, and make connections with the government system.

CURRENT NEWS AND NOTES.

OHIO ELECTRIC LIGHT ASSOCIATION.—The Ohio Electric Light Association is making preparations to entertain the Indiana Public Utilities Association at its convention at Toledo, August 20, 21 and 22.

H. B. COX ON DECK AGAIN.—Harry B. Cox, who some years ago claimed to have solved the problem of transforming the energy of heat direct into electricity, now comes forward with an alleged discovery of similar importance in another field—a chemical substitute for rubber. The *New York Herald* of June 3 contains a lengthy interview with Cox, accompanied with a portrait.

WESTERN UNION OPERATORS.—President Clowry, of the Western Union, has summoned the general superintendents of the company to New York for a conference, for the purpose of preparing for a strike of the telegraphers, whose executive board will meet in New York City on June 10 to take final action on the question of a proposed strike. President Small, of the Commercial Telegraphers' Union, says that the union will not recede from any of its original demands, and while not anxious for a strike, is getting ready for trouble.

MR. B. J. ARNOLD IS RAPIDLY RECOVERING from the accident of several weeks ago, in which his tongue was severed by a blow on the chin while overhauling an automobile. There is every indication that when the union is completely healed, speech will be fully restored without change. The accident occurred at a very inopportune moment, as on the following day the Board of Supervising Engineers of Chicago traction, of which Mr. Arnold is chairman, was to have been finally organized and thereafter hold daily meetings. The plans were, however, only temporarily halted as Mr. Arnold substituted a pencil and pad for speech.

CONVENTION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—The 26th annual meeting of the Association of Railway Telegraph Superintendents will be held at the Marlborough-Blenheim, Atlantic City, N. J., June 19 and 20. Among the papers to be read are the following: "Education of Telegraphers in Railroad Work," by H. C. Hope; "The Superintendent of Telegraph, What He Is versus What He Is Not," by F. E. Bentley; "Maintenance and Operation of Telephone Service on Railroad Company's Lines," by S. L. VanAkin, Jr.; "Opportunities in the Telegraph Service," by G. W. Dailey; "Experiments with Concrete Poles," by G. A. Cellar; "Visible Supply of Telegraph Poles," by W. W. Ashald; "Operation and Maintenance of Railway Telegraph Service," by J. C. Browne; "Wireless Telegraphy," by Wm. Maver, Jr.; "Standard Telegraph Line Construction," by C. H. Bristol and D. R. Davies; "Dry Batteries," by U. J. Fry.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS.—The twelfth annual convention of the International Association of Municipal Engineers will be held at Norfolk, Va., August 7, 8 and 9, 1907, in the City Hall. Norfolk has been selected as the meeting place not only for its position geographically, but also for the reason of the holding of the Jamestown Exposition, giving the delegates a chance to see the very latest developments of the electrical art, which will be on exhibition at that time. The papers selected for this meeting are as follows: "Electrical Inspections and Records;" "Modern Application of Storage Batteries;" "The Value of Volt and Ammeter Tests for Insulation;" "A Modern Fire Alarm Central Office;" "Operation of a Municipal Electric Light Plant." August 9 has been set aside by the exposition management as Municipal Electricians' Day and special features and attentions will be given the electricians at the grounds on that day.

AMERICAN RAILROAD PROBLEMS.—Mr. Stuyvesant Fish, class of '71, will deliver an address on "Some Phases of the American Railroad Problem" before the graduating class and alumni, applied science, of Columbia University, New York, in Havemeyer Hall, at 4.30 p. m. on Monday, June 10.

CONVENTION OF ILLUMINATING ENGINEERING SOCIETY.—The first annual convention of the Illuminating Engineering Society will be held in Boston on invitation of Mayor Fitzgerald, during "Old Home Week," the days of the meeting being Tuesday and Wednesday, July 30 and 31. A strong programme of papers will be presented, and there will be an exhibition of illuminating appliances and measuring instruments. The mayor will address the convention at its opening session.

FIRES IN COLLEGES.—It is stated that so unprofitable have the insurance companies found risks on college buildings that there is prospect of a general increase in rates. The entire May issue of *Insurance Engineering* is devoted to an analysis of school and college conditions. From reports of 322 institutions the editor says: "We learn the lesson from the schools and colleges that precautions against fire have been generally neglected." In eighteen years the figures gathered show that 784 fires in college buildings have caused a loss of $10,500,000 and a heavy loss of life. The average money loss has exceeded $13,300.

NEW YORK ELECTRICAL SOCIETY.—The annual meeting of the New York Electrical Society for the election of officers will be held in the Engineering Societies Building, June 10, at 8 p. m. The following ticket has been selected by the nominating committee: For president, Albert F. Ganz; for vice-presidents, Augustus Post, Theodore Beran, W. L. Conwell; for secretary, George H. Guy; for treasurer, H. A. Sinclair. After the election of officers, Dr. William H. Tolman, director of the American Museum of Safety Devices and Industrial Hygiene, will lecture on "Safety and Security for American Life and Labor."

MAGNETIC UMBRELLAS.—At the Royal Institution in London recently Professor Sylvanus P. Thompson, continuing his course of addresses upon "Studies in Magnetism," said that most umbrellas of modern make were very magnetic. A person standing outside the shop window of an optician and holding such an umbrella would see the needles of the compasses begin to move. Not so many of the old horseshoe or Sheffield magnets were made now as formerly. At one time, before the opening of the Suez Canal, such magnets were in great demand by tea dealers, who used them to rake about with in chests of tea with the object of extracting any odd pieces of iron which the "heathen Chinee" might have put in to make up the weight. Bricks, especially of the red variety, were magnetic, and very retentive of their magnetism. Magnetic qualities had been found in some Etruscan vases from Pompeii, Florence, Rome and Naples, dating in manufacture to about 800 B. C.

PUBLIC UTILITIES BILL.—Mayor McClellan, of New York City, has vetoed the Public Utilities bill, summing up his objections with the words: "With the general principles of this bill I am in accord, but I will never give my approval to a measure that places in the hands of a single political party such tremendous and limitless power." While the main ground of his veto is political, there are other objectionable features, such as the violation of the home rule principle so far as the local commission is concerned. Inasmuch as the members of the commission will be appointed and may be removed by the Governor, they will be merely his agents. The power to regulate rates of fares, in the opinion of the Mayor, may be used to destroy. It will now be taken up again in both houses of the Legislature, and undoubtedly passed over his veto. The full passage of the bill is considered certain, and interest now centers chiefly around the appointment of the commissioners. The salaries and the patronage under the bill involve several hundred thousand dollars annually.

POWER IN CANADA.—The Niagara Power Union of the municipalities of Western Ontario, Canada, has endorsed the power contract made by the Hydro-Electric Power Commission. At a meeting, the terms of the tender were explained to the union by Hon. Mr. Beck, chairman of the Hydro-Electric Power Commission, who stated that tenders had been received from three companies engaged in developing power at Niagara Falls and from one not yet in operation. The offer of the Ontario Power Company was considered the best and it had practically been accepted by the commission, subject to the approval of the municipalities. The terms of the contract were, in effect, as follows: (1) The quantity of power to be taken, 8000 hp to be increased at any time on thirty days' notice in blocks of 1000 hp or more, as might be required, up to 75,000 hp, with an option to a further increase on nine months' notice in blocks of 1000 hp or more, up to 100,000 hp; (2) the amount of power ordered is to be kept available at all times, but 75,000 hp only would be paid for unless more was used; (3) the price for continuous 24-hours' power, originally fixed at $12.40, would be $10.40 per horse-power hour per annum, up to 25,000 hp, thereafter it would be $10; (4) a continuous service would be granted by penalty for interruptions of less than one hour of double the price per power for such time; (5) the contract would be for ten years, and would be renewable for three periods of ten years upon notice; (6) in case the amount of power actually taken should in any month exceed 75,000 hp the basis of payment for that month should be the greatest amount of power for 20 consecutive minutes during that month.

THE PATENT OFFICE.—The Washington correspondent of the *New York Tribune* states that within the last six months the force of the U. S. Patent Office has been depleted by the resignation of two chief examiners, four principal examiners and fourteen or fifteen assistant examiners. In the main these resignations are the result of Congress having failed to grant to these employees an increase of salary, while private concerns stand ever ready to pay men with Patent Office experience considerably more than does the Government. The force is recruited through the Civil Service Commission, but at the salaries offered the commission finds it difficult to secure competent men, as is shown by the fact that out of 135 men who took one or other of the last two examinations only 17 qualified. When Congress meets again Commissioner Moore, with the support of Secretary Garfield, will go before the Committees on Patents and urge that the force of the Patent Office and the compensation of its employees be made commensurate with the volume and character of the work performed. He will submit the fact that the present average number of new cases filed each week is 1200, while applications for rehearings and consideration of new claims vastly increase this number. He will show that the Patent Office not only sustains itself, but turns into the Treasury a large profit every year, and that the force can be made adequate and the compensation satisfactory, and still leave the office a paying institution. He is confident that when these facts are properly placed before Congress little difficulty will be experienced in securing the necessary funds whereby the work can be brought up to date and maintained there. Commissioner Moore, who has in the past adjudicated many of the cases which have been appealed to the Commissioner in his judicial capacity, enjoys the confidence of the patent attorneys, and his promotion has had a salutary effect on the entire force, so that there is every reason to expect that hereafter the condition of the United States Patent Office will not only prove more satisfactory to those who have to do business with it, but that it will reflect credit on the Secretary of the Interior and on the administration.

Electricity in the Government Buildings in Washington.

THE United States Government, however slow the movement of its ponderous organization, has manifested a swift appreciation of all the benefits that practical electricity can bestow. All the government buildings in Washington, therefore, are supplied with electricity, although in many of the antiquated isolated plants this is generated at some little cost. Plans are now being executed with a view to consolidating all the various smaller electrical plants into two central power stations; one to feed the group of buildings on Capitol Hill, a description of which was published in the June 1 issue, and the other to feed the group of buildings around the White House, the work on which has not yet been started, but the realization of which is now only a matter of a few years.

The necessity for some such arrangement is manifest from the fact that in the nine buildings of the executive group alone there are 73 boilers, aggregating some 4500 horse-power under which are burned annually from 20,000 to 23,000 tons of coal, most of which is anthracite. These buildings are also furnished with engines, generators and steam pumps, approximating in the aggregate 2500 horse-power, and there are employed in connection with this segregated system about 145 attendants in various capacities. The degree of efficiency obtained in the buildings is on the whole very poor, as might be expected from the obsolete apparatus installed; and the estimated saving by supplying the executive group from a central station located near the present B Street station of the Potomac Electric Power Company is in the neighborhood of $120,000 per year.

THE CAPITOL.

This colossal old structure has been developed from time to time into its present magnificence, although the task of bringing a building which is more than 100 years old up to modern standards in the matter of light, heat and ventilation was not an easy one. The work of transforming the structure has been fraught with unusual success, however, so that electricity has followed close upon the heels of kerosene and gas in a building not primarily designed for such a system. The importance of the two electrical plants now operating in the Capitol may be

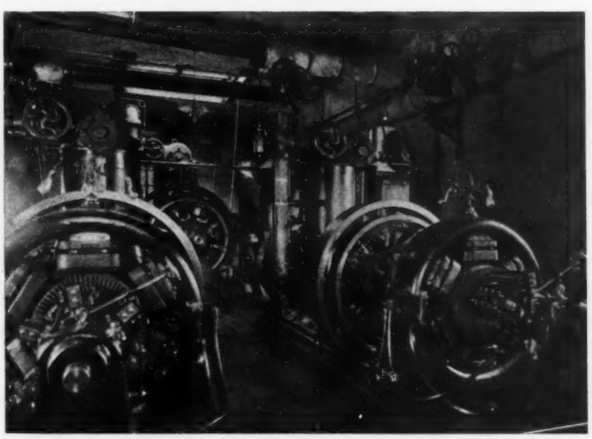


FIG. 1.—SENATE POWER PLANT.

realized when it is stated that the lighting, heating, ventilating and elevator systems are all dependent upon them for their source of power and operation, so that if the electric plant should fail business at the Capitol would be at a standstill.

The two plants at the Capitol are located, one in the House terrace and one in the Senate terrace. Both are of equal power and are somewhat alike in equipment. Originally there was installed in the Senate wing a small alternating-current plant and later one of the same type in the House wing. At first only a small number of lamps were placed in the most prominent committee rooms; but electric light grew so in popularity among the senators and representatives that the units were soon overloaded. The plant now in operation was installed in 1896. The equipment consists of four 350-hp and four 225-hp compound condensing engines direct-connected to 110-volt generators. The steam is furnished for these units by water-tube boilers at a pressure of 100 lbs. The wiring throughout is on the two-wire system and there are in the neighborhood of 30,-

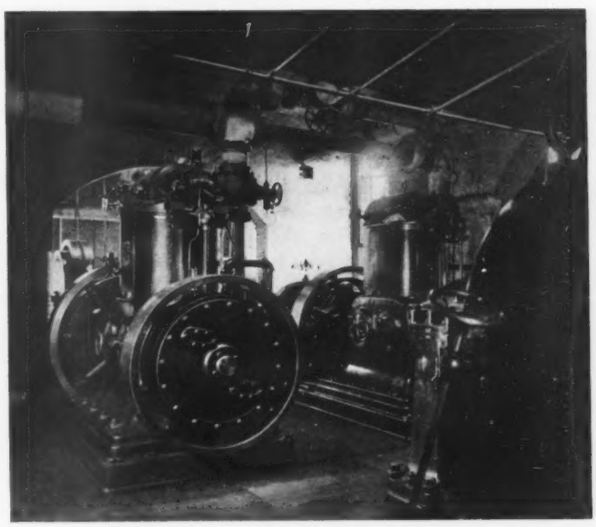


FIG. 2.—POWER PLANT; HOUSE OF REPRESENTATIVES.

000 incandescent lamps connected in circuit. The lamps for lighting the Senate and House chambers are grouped above the frosted glass panels of the chamber ceilings, pleasing indirect illumination being thus obtained on the desks 26 ft. below. The rotunda is lighted by four circuits of 16-cp lamps placed on the cornices and back against the wall. Almost 2000 lamps are used in the rotunda.

The system by which vast volumes of air are thrown into the legislative chambers is very interesting, and depends upon electric motors for its operation. In the western grounds of the Capitol are two towers hidden among trees. These towers are intakes and are connected to the building through tunnels.

CONGRESSIONAL LIBRARY.

The Congressional Library, upon which time, money and talent have been unsparingly lavished, is without doubt the finest building of its kind extant. It is not the purpose of this article to go into any account of the superb decoration that has been placed on the walls, or of the special paintings, statuary, marbles, mosaics, etc., other than to direct attention to the fact that the use of electricity has rendered possible the freest resort to such ornamentation and is the surest preventive of their spoiling; while at the same time better illumination of them can be effected generally.

The steam plant is situated under the east parking and the electric plant is 140 ft. distant in the basement. The battery of boilers consists of 16 60-hp horizontal tubular boilers supplying steam at 85 lbs. Anthracite coal is used, and this is stoked by hand. The boiler room is entirely covered by a glass skylight.

The engine room equipment consists of four Ball engines of the straight-line, single-cylinder, non-condensing type. Three of these are direct-connected to 100-kw Siemens & Halske 130-volt external commutator machines, and the fourth unit is direct connected to a 25-kw General Electric unit.

Five boosters are located back of the switchboard to step up the voltage on the long feeders. The switchboard is of white marble and contains six panels. The automatic cut-outs are equipped with carbon-breaking contacts. The wires and cables are carried throughout the building in iron armored insulated

piping. The wiring is of the two-wire type and the 20 feeders are capable of supplying 8000 lamps. The ventilating equipment comprises 14 30-in. fans driven by ¼-hp motors.

The entrance to the library is illuminated by 14 clusters of incandescent lamps mounted on ornamental standards. The rotunda is lighted from the cornices, where there are placed about 3000 32-cp lamps. Cornice lighting plays a prominent part in the illumination of the building and in some of the smaller reading rooms chandeliers and side brackets are used. In the main reading room under the rotunda, the desks are arranged in circles and carry 12-cp lamps on short standards with shades. The halls are lighted by 16-cp lamps wired into the cornices. The lamps in the main reading room and the dome are controlled by seven automatic switches located in the basement and under push-button control.

Of special interest is the mechanism installed for the delivery of books from their places in the stacks to the reading room and the Capitol. An endless cable, driven by electric motors at a speed of 100 ft. per minute, runs from the cabinet on the west side of the distributing desk in the center of the reading room, across and up through the stack to the top and back again.

STATE, WAR AND NAVY DEPARTMENT BUILDING.

The duties which this plant is called upon to perform are as follows: The heating of the State, War and Navy Department Building; furnishing power for nine hydraulic elevators; generating electricity for lamps and motors in the State, War and Navy Department Building, the White House, the Mills Building, the Depot Quartermaster's Building, the Spieden Building, the War Department Stables and the Ordnance Annex, and operating the house and fire pumps.

To accomplish these ends the following was the old equipment: Twenty-four horizontal return-tubular boilers, 12 for steam and 12 for hot water. These were installed in 13 separate boiler rooms and had grates for burning anthracite furnace coal. There were six widely separated elevator pumps, all running non-condensing and all but one single acting. The electrical equipment consisted of one 120-kw Ball & Wood-Westinghouse generating set, one 100-hp Armington & Sims engine belted to two 40-kw Edison bi-polar generators, and one 100-hp McIntosh & Seymour engine rope-connected to two 40-kw Edison bi-polar generators. In addition to this there were two Davidson house pumps and four old fire pumps.

The steam pressure carried was about 80 lbs., and the steam line connecting boilers, pumps, engines, etc., was about 1700 ft. long. The steam boilers aggregated about 575 horse-power and were barely able to supply sufficient steam on dark days with the elevators all running. The result of this layout was a $30,000 annual coal bill and a very large payroll for firemen and engineers.

Owing to the energy of First Lieutenant John Hudson Poole, of the Corps of Engineers, U. S. Army, who is now superintendent of the building, a new power plant is now under construction. This plant will consist of four 200-hp B. & W. boilers in one boiler room; one 600-hp Cochrane feed-water heater; one 150-kw and one 75-kw Curtis turbo-generators running condensing, together with one 120-kw Ball & Wood engine set which will be held as reserve. In the pump room will be installed a Laidlaw-Dunn-Gordon compound triplex condensing crank and flywheel elevator pump, which will feed all the elevators, together with one compound Worthington elevator pump which will be held for reserve. In the heater room there will be four steam heaters, two exhaust and two live steam, for heating the convection water of the present hot-water heating system. There will also be installed one motor-driven centrifugal house pump.

Two of the new boilers will supply the building with sufficient steam for both heat and power, and to operate the turbo-generator and high-duty elevator pump. The two exhaust steam heaters are Alberger corrugated copper tube, surface condensers, each having 1000 sq. ft. of tube surface. During the fall and spring a vacuum of about 22 ins. can be carried for the turbine and elevator pump, the convection water of the building at about 150 degrees F. acting as circulating water in the condensers. During winter weather the high-duty pump and the turbine will run practically non-condensing, all the exhaust being needed for heating. In extremely cold weather one of the live steam heaters will probably have to be used in series with an exhaust steam heater. The circulation in the heating system will be made positive and controllable by the use of a centrifugal circulating pump. During the summer months, the flow main will be cut off from the exhaust steam heaters, the cold water connection opened, and each can be operated as a regular surface condenser carrying a high vacuum. The circulating water being perfectly clean will discharge into a large subterranean reservoir from which it will be pumped to the house tank by the motor-driven house pump and used throughout the building for toilet purposes.

The new plant will cost approximately $100,000 and will make an estimated saving of approximately $30,000.

DEPARTMENT OF THE INTERIOR.

The buildings devoted to the business of the Department of the Interior are furnished with electricity and steam from a central power plant located in what was once the General Post Office and which is now used by the General Land Office and Bureau of Indian Affairs. The plant supplies electricity and steam for this building as well as for the Patent Office Building, the Pension Office and the Civil Service Building. A 4 ft. x 6 ft. tunnel connects the Patent Office and the Land Office Buildings and this serves to carry the steam piping and the electrical cables for the Patent Office. It also carries the cables for the Pension Office to a point where the tunnel is intersected by a four-duct conduit leading to the latter building, 1400 ft. away.

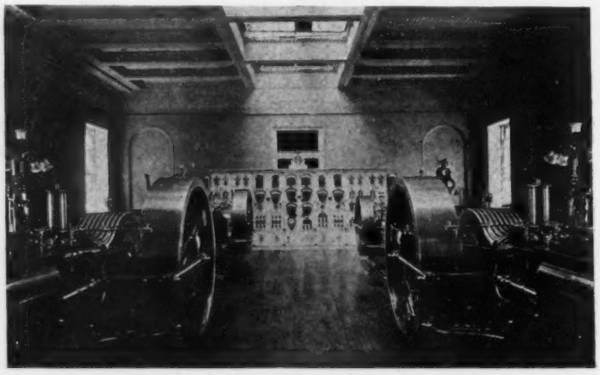


FIG. 3.—POWER PLANT OF THE INTERIOR DEPARTMENT.

The boiler plant comprises five Heine boilers, four of which are set in batteries and the other is left single. The boilers are equipped with Wilkinson automatic mechanical stokers and supply steam at a pressure of 150 lbs. Four feed-water pumps supply the feed-water to the boilers through a Hoppes open feed-water heater. A steam pump with an automatic governor is located in the pump room and connects with the returns of the Patent Office Building heating system, the water from which is returned to the boilers. Under ordinary load natural draft is sufficient; but an induced draft equipment consisting of a 6-ft. fan belted to a 20-hp motor controlled by an automatic regulator, is provided. The boiler room being located below the level of the city sewers, a blow-off tank is provided for blowing off the boilers and the water is pumped from this tank to the sewers after it has been cooled somewhat by standing.

A vertical bucket ash hoist is used to convey the ashes to an ash tower in the courtyard above, and this conveyor is driven by an enclosed motor. Buckwheat coal is used exclusively and this is stored in vaults connecting with the boiler room through a tunnel. The coal is brought into the boiler room by barrow and a careful record is kept of the fuel consumed.

The boilers are connected by long bends to two 8-in. steam headers, one located over the front and the other located over the rear of the boilers. These headers extend through a vaulted space above the coal tunnel to a cross-header in the pump room, where valves are provided for cutting out either header as desired. Two 4-in. lines are carried from here direct to the Patent Office Building passing through the tunnel previously mentioned to a point in the basement of the building, about 700 ft. from the boiler room. The steam pressure is reduced by two valves in series from 150 lbs. to 5 lbs. A steam pump for the hydraulic elevator is supplied with steam from a 3-in. line supplying the south wing and a reserve triplex pump is provided, which is motor-driven.

The engine room contains four direct-connected units; two of 100-kw capacity, one of 75-kw capacity and one of 50-kw capacity. Three of the engines are tandem-compound and the other is a simple engine. The entire equipment was supplied by the Ridgway Dynamo & Engine Company. The voltage at the board is 228. From the switchboard, four feeders are carried to the Patent Office, where a pressure of 220 volts is maintained throughout. Four feeders are also run to the Pension Office, where a potential of 210 volts is maintained. The feeders vary in size from No. 0 to 350,000 circular mils and run to central distributing boards in each building.

An effort is made to control the drop in the feeders by throwing various feeders into and out of circuit at the switchboard. The smaller feeders are used on night loads and as the load increases during the day, the larger feeders are cut in. By this means boosters or other devices for increasing the voltage are avoided.

Before the installation of the central power plant, the Patent Office Building was supplied with steam for heat and power from seven different boiler rooms, and the Pension Office Building and the old Post Office Building were supplied by their individual plants. Gas was used exclusively for lighting. Electricity has superseded gas for illumination and other economies have resulted from the consolidation of the plants. The old Post Office Building, which was formerly heated by hot water and which necessitated the burning of 800 tons of coal, now utilizes the exhaust from the engines to heat the water of the heating system. The buildings mentioned are wired for about 6000 incandescent lamps and in addition, energy is furnished for the branch printing office motors in the Patent Office Building, electric elevator, electric pumps, fans, and various other small motors in the buildings. Mr. J. S. Hill is chief engineer of the plant.

BUREAU OF ENGRAVING AND PRINTING.

One of the most interesting groups of government buildings is that of the Bureau of Engraving and Printing, where all currency, both national and bank, and all postage and revenue stamps are printed. Electric motor drive is used on all machinery throughout the buildings, and about 250 motors ranging in size from 1/6 horse-power to 40 horse-power are required for the work. During the summer months there are upwards of 280 desk and ceiling fans in daily operation. The lighting equipment of the buildings and grounds comprises 16 arc lamps, 50 mercury vapor lamps and approximately 4000 incandescent lamps. There are four buildings in the group, and the electricity is generated in a central plant located on the ground floor and near the center of the south building. Brick and cement-lined tunnels connect this building with the other buildings, and through these the steam piping and electric cables pass to the distributing centers.

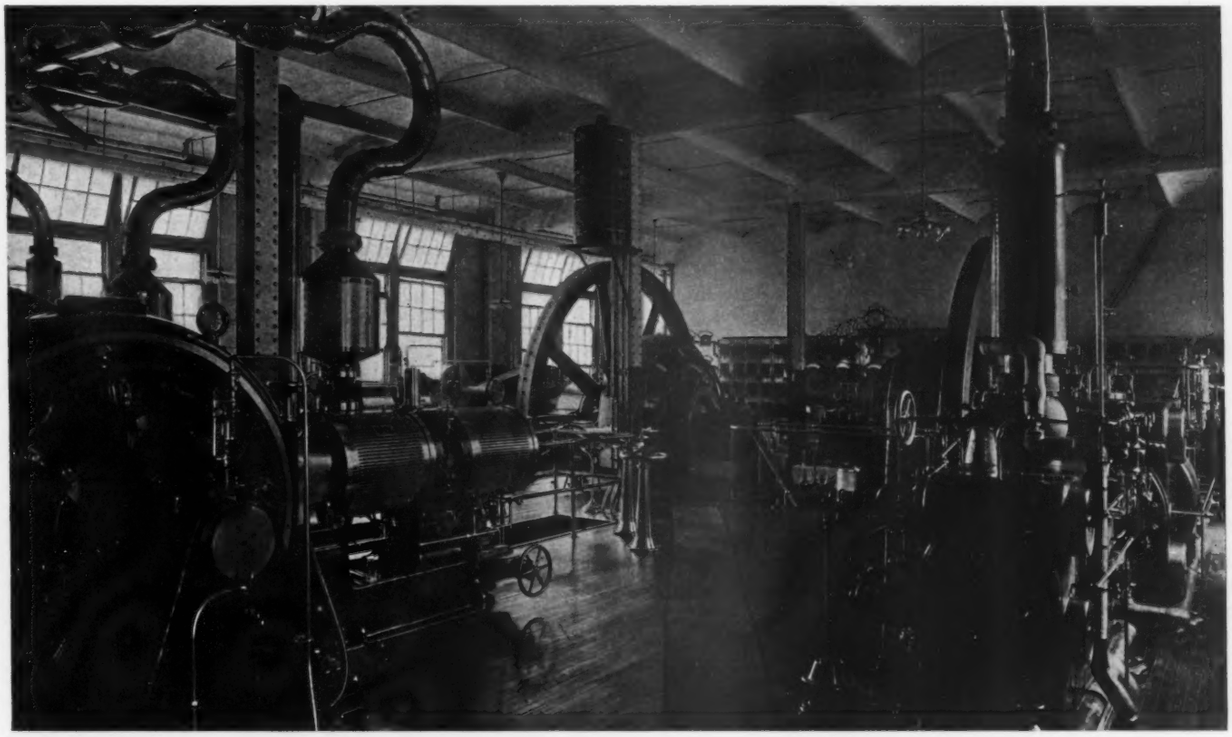


FIG. 4.—DYNAMO ROOM; BUREAU OF ENGRAVING AND PRINTING.

The boiler plant consists of three 250-hp water-tube boilers and four 125-hp water-tube boilers, the former operating at a pressure of 125 lbs. and supplying the engines and pumps, and the latter operating at a steam pressure of 70 lbs. and supplying steam for the washing and drying requirements of the bureau. All of the boilers are fitted with Hawley down-draft furnaces and use bituminous coal under natural draft. The breeching from both the high and low-pressure boilers enters an iron-bound brick stack 200 ft. high. A damper regulator is attached to the breeching dampers of each set of boilers. Coal is delivered in carts and after passing through a crusher is carried by bucket conveyor to storage bins of 600 tons capacity, located above the boilers. The same conveyor travels under the floor of the boiler room and takes the ashes to an elevated ash bin, from which they are loaded directly into carts. A

traveling scale running the length of the boiler room, receives the coal from the storage bins and discharges it into the feeding hoppers placed directly over the furnaces. The conveyor, crusher and traveling scales are each operated by an enclosed electric motor.

The engine equipment consists of four horizontal tandem-compound condensing engines, direct connected to 220-volt direct-current generators. Two of the units comprise 450-hp engines and 300-kw generators, the remaining units being 200-hp automatic engines and 125-kw generators. All of the exhaust piping and the receivers between the high and low pressure cylinders are placed in the basement, together with the condensers and vacuum pumps. The piping to each set of vacuum pumps is arranged so that either pump may be used with either of its corresponding engines. A vacuum of 26 ins. is maintained on the exhaust lines. A branch exhaust line provided with stop valve and oil separator supplies the steam for heating the buildings in winter.

The two-wire, 220-volt system of electric distribution is used for both lamps and motors, 226 volts being maintained at the switchboard. The large units carry the load from 7 a. m. until midnight, at which time the load has diminished to such an extent that the smaller units can carry it. The main switchboard is composed of 15 panels and is 30 ft. long. There are two sets of triple bus-bars, one set being used for lighting and the other set for feeding the motor circuits. The first three panels on the board are used for controlling the lamp circuits; the next four are generator panels, the fifth is an equalizing panel and the remaining panels are used to control the various feeders to motor circuits. The generator switches are arranged so that the lamp and motor busses may be fed from independent generators, from the same generator, or from two or more generators operating in multiple. Lead covered cables are used between the generators and the switchboard and between the switchboard and the various distribution centers. These cables are supported on iron cable racks beneath the floor of the engine room and to the walls in the basements and tunnels. The entire power plant is one of the most efficient now in use by the government in Washington. There are five electric elevators in use in the buildings.

Adjoining the power plant on the east, are the shops for the repair and maintenance of the machinery and buildings. These shops are operated by electric motors. The equipment consists of various sizes of engine lathes, planers, shapers, grinders, milling machines, drill presses, boring mills, pipe cutting and threading machines, wood working machinery, etc. To the west of the power plant is the ink making department. The ink mixers are motor driven, and the 11 mills in the grinding room are each operated by electric motors. These are 7½ to 10 horse-power in size, and are either geared direct or operate through silent chain drives.

All the currency, the higher denomination of postage stamps and a large portion of the revenue work are printed on hand plate presses, of which there are over 500 in use. After printing the sheets are spread on wire trays and a slight draft of heated air is passed over them for several hours. The air for this purpose is drawn over steam coils by a motor-driven fan located on the floor below the drying room. There are 23 numbering presses in use for numbering the bank notes, etc., and each press is operated by a 1-hp motor.

Ordinary postage stamps are printed, 400 on a sheet, on 22 power plate printing presses, each directly geared to a 5-hp motor. Mercury vapor lamps are used for the illumination of this press room. The gumming equipment comprises eight electrically-driven machines and the heated air for drying the gum is forced over steam coils by a fan driven by a 25-hp motor. The perforating machines, of which there are 34, are each driven by a ½-hp motor. As the postage stamps are delivered from these machines, the sheets are placed between cardboard tissues and are passed through a heavy, electrically-operated roller press, which leaves the sheets of stamps smooth and flat. The stamps for booklets are sent to a stamp book room where the paraffin paper is placed between the sheets and the backs and faces of the books are assembled. The books are bound in strips of ten, glued and stitched, and finally separated into individual books by means of cutting machines. All the machinery in this room is operated by individual motors, seven wire stitchers, four paper cutters and one rotary separator being used in the work.

Such revenue work as is not printed on plate presses, is done on dry paper by surface printing. The equipment in this branch consists of 21 flat bed stop cylinder presses, eight pony cylinder presses and three automatic-feed high-speed rotary presses. Each press is motor driven, the connection between the motor and the press being gears, silent chain or belting, according to the type of press and the general requirements of the work. The work is dried and pressed in the same manner as the bank notes and is perforated on machines similar to those used for perforating the postage stamps, excepting that the perforations are in the form of a slit. Forty machines are in daily use, and each is belted to a ½-hp motor.

All currency and other government securities which have been redeemed by the department are never reissued; but are destroyed by maceration. Paper representing a monetary value of about $2,000,000 is destroyed by this means daily. The paper is mixed with the proper amount of lime and soda ash and subjected to steam pressure. Four macerating cylinders are required to reduce the paper to pulp and all the machinery is driven from line shafting connected to a 40-hp motor. Besides the equipments described, a laundry is provided for washing, starching and drying the wiping cloths used on the plate presses. There are here located 12 iron cylinder washers, three metal starchers, three wringers, ten mangles and two drying boxes. The entire equipment is operated from a motor driving a line shaft.

Prior to the installation of the power plant and the introduction of electric motor drive, the bureau was operated by means of small isolated steam engines, supplied from a central boiler plant, and an extensive system of shafting with belting was in use. The centralizating of the power plant and the adoption of the electric motor as a means for driving the machinery have, despite the increase in the output, resulted in a saving in the coal consumption of 1200 tons per year. Mr. F. K. Boomhower is the chief engineer of the plant.

POST OFFICE DEPARTMENT BUILDING.

The present Post Office Building is a modern structure on the south side of Pennsylvania Avenue at Eleventh and Twelfth Streets, which contains both the General Post Office Department and the city post office. The power plant is located in the basement, and while it is not especially remarkable, compared with the other isolated plants in government buildings in Washington, it is a fair installation. The boiler room contains 12 100-hp horizontal tubular boilers installed in four batteries of three each, one battery being sufficient for ordinary normal loads. The piping is so arranged that the batteries of boilers may be used independently or in multiple. The furnaces are equipped with Roney stokers for burning soft coal and the steam pressure carried is 100 lbs. City water is used for boiler feed purposes, and all condensation is trapped and emptied into the heater whence it is pumped into the boilers.

The principal elevator work is hydraulic, the pumps for which are of high efficiency design. There are, however, three electric elevators in use, two for freight and one for passengers. The speed of these elevators is 200 ft. per minute and the lifting capacity 1000 lbs.

The engine room installation comprises four 150-hp tandem-compound Buckeye engines running non-condensing. Each of these is direct-connected to a 120-kw, 125-volt Thresher direct-current generator. The latter are guaranteed to carry 25 per cent overload for three hours and a 50 per cent overload for two hours, being under rated. The exhaust from the engines is used in winter for heating the building. The steam piping system throughout is designed for low pressure.

The switchboard is made up of four generator, three motor and four lighting panels, and is fitted with the usual instruments. The feeders, four to a floor, are connected to distribut-

ing panels located at each corner of the various floors, for distribution and control of the circuits on that floor. The panels are fitted with fused-knife switches and are arranged in subcircuits of not over six amperes to the circuit. The number of lamps installed in the building is approximately as follows: Six thousand 16-cp, 300 8-cp, 350 32-cp incandescent lamps and 30 700-cp mercury vapor lamps. In addition there are about 400 electric fan motors in use.

Electric motors are used for a variety of purposes, the aggregate motor capacity being about 200 horse-power. Motors are used for the indirect heating system, for the exhaust and intakes, in the carpenter shop, machine shop, electric repair shop, for canceling-stamp machines, on paper cutters, printing presses, for pressing paper rolls and for many other purposes.

THE NATIONAL BUREAU OF STANDARDS.

The National Bureau of Standards was established July 1, 1901. Its functions include the custody of the national standards used in measurements of length, mass, capacity, temperature, electricity, optical properties of materials, illumination, density, pressure, velocity, physical properties of materials, and also the testing of all kinds of weights, measures and measuring instruments used throughout the country for commercial, technical or scientific purposes. It is further authorized to prepare and duplicate standards, their multiples and subdivisions, and to conduct scientific investigations concerning physical constants and such other subjects as may be required.

The new laboratories are located at the highest available point in the District, upon a site carefully selected for its freedom from mechanical and electrical disturbances and at an elevation of over 350 ft. above the Potomac River. The mechanical building contains the mechanical equipment, the instrument shop, about one-half of the electrical work, photometry and engineering testing. In the boiler room are two 125-hp water-tube boilers together with an economizer and forced draft outfit. Space is reserved for additional boilers. On a platform along the north wall are the filters, electric and steam-driven high-pressure water pumps, boiler feed pumps, feed-water heater and other auxiliary machines.

The engine room contains a 120-hp tandem-compound engine, direct-connected to two 120-volt generators connected in a three-wire system and a smaller unit of 40 horse-power. Besides these there are a double motor-driven booster for charging storage batteries; a pair of two-phase alternators, surface wound and giving an e. m. f. of nearly sine-wave form, direct connected to an electric motor. One machine gives 60 cycle current and the other 180. By coupling them and by varying the speed various frequencies may be obtained. Another three-machine set contains two 60-cycle, three-phase alternators and a second smaller set gives two 60-cycle currents of adjustable phase relation. A three-phase, 120-cycle alternator driven by an inverted synchronous converter used as a motor is also in use together with a 10-machine set containing eight alternators and two driving motors all direct-connected, but capable of being uncoupled into two sets. One set has besides driving motor, three alternators of 6, 18 and 30 poles respectively, giving 60, 180 and 300 cycles. The second set has five alternators, giving 420, 540, 660, 780 and 900 cycles respectively. All the machines may be joined in series.

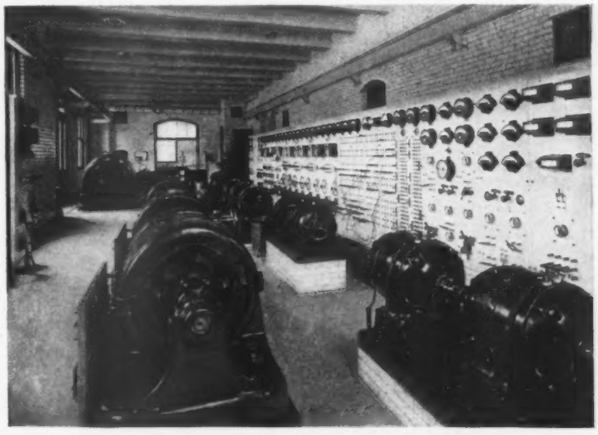


FIG. 6.—DYNAMO ROOM; BUREAU OF STANDARDS.

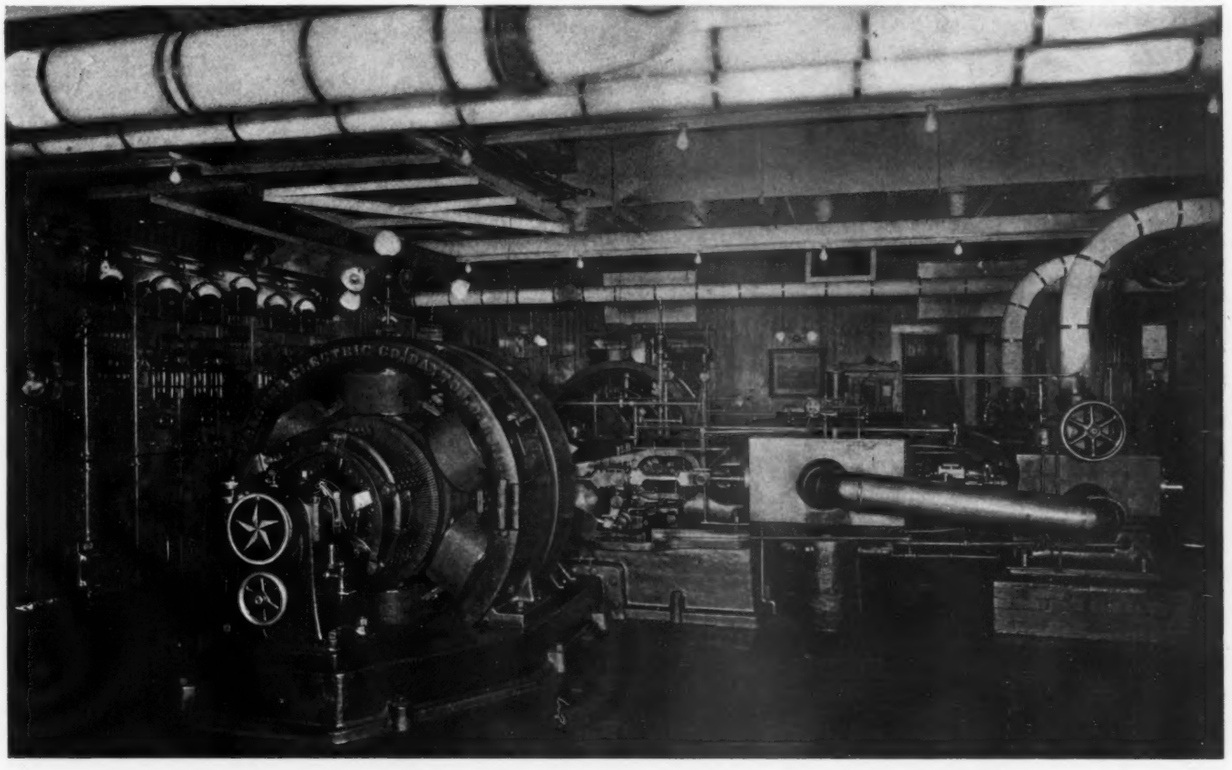


FIG. 5.—GENERAL VIEW OF DYNAMO ROOM IN POST OFFICE DEPARTMENT BUILDING.

The switchboard controls the various direct and alternating current generators as well as six storage batteries arranged in groups of two on the three-wire system. There are also several plug panels which enable any generator or battery to be connected to any laboratory room in either building.

The electrical division of the Bureau is very well equipped. Any one interested in photometry would be amply repaid for a visit to the Bureau of Standards to examine the equipment and the work of the Bureau in this particular branch of applied physics. The intention is to provide every facility necessary for experimental work, both for research and for testing. It is the constant purpose of the Bureau to co-operate with instrument makers and manufacturers to the end that the output of instruments and apparatus may be improved. It affords a place where instruments and standards may be verified with the highest possible precision and facilitates precision work both in engineering and in research. A complete description of the Bureau of Standards, together with the scope of the work performed, was given in a paper by Prof. S. W. Stratton and Prof. E. B. Rosa before the Nov. 24, 1905, meeting of the American Institute of Electrical Engineers.

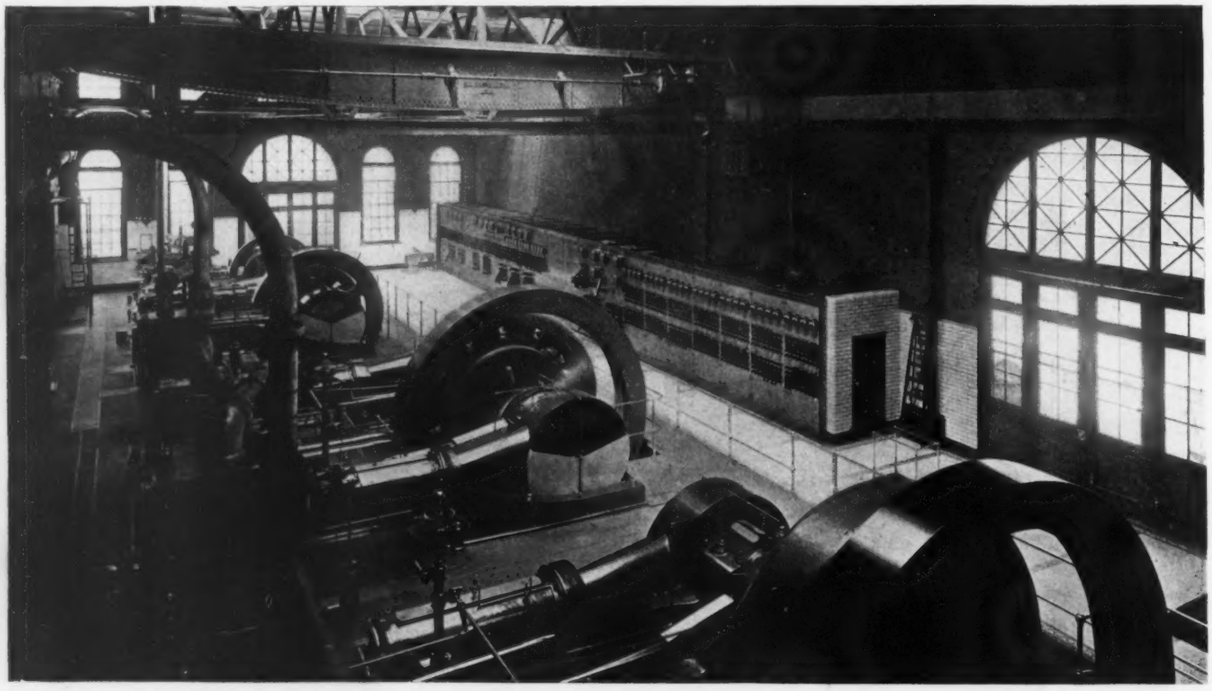


Fig. 7.—Plant of Government Printing Office.

GOVERNMENT PRINTING OFFICE.

The Government Printing Office is the largest establishment for printing in the world. The power plant is in a separate building, which is divided longitudinally between the engine and boiler rooms. In the boiler room there are eight 300-hp Scotch marine-type boilers with economizers and circulating pumps. The boilers are fitted with suspension furnaces and shaking grates. The average steam pressure carried is 120 lbs. An accurate account is kept of all the coal used and the consumption of water is checked by meter. The flue gases, by means of baffle plates in the economizers, are utilized to the utmost extent. The stack is 150 ft. high and is lined inside with firebrick to within 30 ft. of the top. All condensation is returned to the boilers.

The engine room contains four cross-compound condensing engines, one of 200 horse-power, one of 450 horse-power and two of 800 horse-power capacity. Each is direct-connected to a 125-volt direct-current generator. The steam main connecting the engines with the boilers is of sufficient capacity to supply any sudden demand, so that drums are eliminated. The connections between the boilers and main and from the main to the engines are of copper, making expansion joints unnecessary. The engines are so constructed that either side may be run independently. Syphon condensers located on the roof are used in connection with the engines, the injection water being taken from the city supply. This water is afterwards pumped into tanks and used for toilet purposes.

The switchboard is 82 ft. long and is equipped with two sets of bus-bars, one for the lamp circuits and the other for motor circuits. All feeders are protected by circuit-breakers mounted on panels at the rear of the board. The generators are also protected by circuit-breakers behind the boards, and controlled by push buttons on the front of the board. An idea of the magnitude of the power distribution system may be obtained by a consideration of the material used in the work. This includes 13,094 linear feet of terra conduit, 55,068 ft. of flexible metal conduit, 14,000 pieces of lead bushing for the flexible conduit, 1822 for outlet and junction boxes, 8248 pieces of enameled pipe, 145,811 fittings of all kinds, 394,375 ft. of wire of all classes, 1649 switches, 91 distributing centers, 1490 ft. of lead tubing and 807 ft. of ¾-in. black pipe, 1490 cut-outs and 1310 castings of all kinds.

The motor installation is very large, there being in the neighborhood of 1000 motors in use varying in size from 1/6 horse-power to 100 horse-power. In this building may also be seen a most striking use of electricity for heating purposes, the installation being one of the largest in the world. The use of electricity for heating is broadly divided into two groups. One of these embraces the foundry and includes the matrix drying tables, wax stripping tables, wax melting kettles, case warming cabinets, building-up tool heaters, case warming tables, wax knife cutting-down machine, "sweating on" machine, and soldering iron heaters. The other class in the bindery includes embossing and stamping press heads, glue heater equipments, glue cookers, case making machines, finisher's tool heaters, book cover shaping machines, etc. These electrically-heated appliances supplant gas and steam heated appliances in all the processes except in the stereotype melting pots. Space limitations will not permit of going into the details of the equipment of this immense printing establishment. For a more detailed description of this establishment, readers are referred to the issues of Electrical World and Engineer of Jan. 2, 9 and 16, 1904.

Washington Convention
National Electric Light Association

TUESDAY MORNING.

THE first session of the thirtieth convention of the National Electric Light Association was called to order at the Willard Hotel at 10:15 a. m. Tuesday, June 4, 1907, with President Arthur Williams in the chair. He immediately introduced Gen. Geo. H. Harries, vice-president of the Washington Railway & Electric Company. General Harries spoke of the government of Washington and the District of Columbia as a form of government that many of the members might envy. It was a clean government. Every dollar contributed by the tax-payer was put to its proper and legitimate use. He then introduced as one of those charged with the government of the city, Hon. H. B. F. Macfarland, president of the Board of Commissioners of the District of Columbia. Commissioner Macfarland proceeded in a very witty vein, complimenting his introducer and expressing the wish that the convention might be at Washington every year. Washington had been the permanent or temporary home of many men prominent in early electrical development, among whom were Joseph Henry, S. F. B. Morse, and Alex. Graham Bell. The first telegraph line was between Washington and Baltimore. He had no keys of the city to offer to the delegates, as they were American citizens entitled to consider that they were at home in the capital city of the nation.

President Williams, in his address, made some interesting comparisons between the condition of the association and of the industry at present and in 1894 when the N. E. L. A. last met at Washington. Then there were 107, and now there were 709 companies as members. The aggregate membership of all classes was 1286 now. There were 2300 central stations in the United States in 1894 according to President Armstrong's address. There were now according to Mr. T. C. Martin about 5000 central stations in North America with an investment of $850,000,000 and a yearly revenue of $170,000,000. In 1894 the predominating thought was technical and mechanical. Now the predominating thought was of commercial general policy. The technical end of the business had not, however, been neglected. He then reviewed the principal features of the prepared programme and exhibits, referring to the questions of new illuminants, street lighting specifications, the work of various committees, the decline in the municipal socialism or municipal ownership idea and the desirability of the association expressing itself formally with regard to rates. As to the latter he thought it might be desirable to formulate several general plans for charging for current which would receive its endorsement and sanction. He also proposed another plan whereby members could be kept posted on legislation proposed in different states relating to electric light companies.

Following the president's address Secretary W. C. L. Eglin read an invitation from the Consolidated Gas, Electric Light & Power Company of Baltimore inviting those wishing it to visit its Westport power house on a special train Wednesday afternoon. A letter was read from Dr. Clayton H. Sharp, president of the Illuminating Engineering Society, calling attention to the annual convention of the society July 30 and 31, at Boston.

REPORT ON PROGRESS.

Mr. T. C. Martin opened the programme of prepared papers by giving a synopsis of his report on progress.

It was one of the fullest papers at the convention, occupying over 60 pages. It spoke of the rapid advances made in the industry during the past two or three years as compared with the stagnation of the period immediately preceding, and gave, as usual, some data of growth. The number of new central-station enterprises for 1906 was difficult to determine, but was probably in excess of 300. The *Central Station List* for March, 1907, reported 138 for the preceding six months and a total of 4902 for the United States, Mexico and West Indies. The total does not increase in proportion with the new plants, because the constant tendency toward consolidation operates steadily in the direction of lessening the gross number. The same tendency toward consolidation has had the effect of increasing capitalization, however, on account of the new money thus brought into the industry and the larger body of securities that can be floated and made profitable by the ensuing economies and higher efficiencies. Assuming that the capital increased 20 per cent during the year, it would appear that the total at the end of 1906 invested in the American central-station industry was $850,000,000. The gross earnings for 1905 were estimated last year at $135,000,000. For 1906 they may be put at $165,000,000. Many of the larger companies experienced and have reported a growth above 20 per cent. Total operating expenses at 70 per cent would represent about $115,000,000, leaving, say, $50,000,000 net, or, roughly, 6 per cent on the whole investment and capitalization. In view of the risks, changes and high executive skill demanded, this cannot be regarded as in anywise excessive. No private enterprise, such as a dry goods store or a grocery, could be run on such a narrow margin.

Comparisons were made with England and Germany, and data were cited as to gas consumption in cities all over the world. The next section dealt with newer central station work as illustrated at Lynchburg, Va.; Toledo, Ohio; Denver, Col.; Effingham, Ill., and some aspects of the rate and franchise problems were referred to next. An interesting part of the report gave a summary of more recent methods of varying the old familiar styles of street lighting, and a description was given of the arch lighting practice in Denver, Col.; Columbus, Ohio; San Antonio, Tex.; Lincoln, Neb.; Los Angeles, Cal.; Connellsville, Pa., etc. Information was also presented as to special sidewalk arc services in Minneapolis and Cleveland.

The next section discussed methods of transmission and distribution, citing some of the recent 60,000 volt work, the relation of the new metallic filament lamps to distribution voltages, and the delivery of power in large blocks in Detroit at high voltages. The next section dealt with illuminating engineering, testing of lamps, the new British lamp specifications, etc. A subject of more than usual interest was next taken up in "central station employees," under which head were discussed the attractiveness of the field for educated men, the training of mechanics for the plants, the value of premiums on good performance and economies, and the development of a business-getting staff.

Several pages of the report were next devoted to the live topic of old and new lamps—luminous arcs, tantalum, tungsten, helion, osmium, etc.—in regard to which considerable data were assembled. Note was also made of advances in tube lighting and other variants. This was followed by a discussion of motors as a source of income to stations and of the productiveness of heating and cooking appliances. Details were also given as to the use of current in radiators, in cutting steel beams, welding, floor polishing, refrigeration, shoe cleaning, etc. The last part of the report dealt with insurance and its rates, safety appliances, rules for electric signs, symbols for wiring and State electric commissions.

Messrs. Samuel Scovil and Alex. Dow suggested that inasmuch as the report covered such a wide range of subjects,

many of which were to be discussed by later papers, it would be in order to defer discussion on this report until these various subjects were taken up in detail. This was ordered by the chair.

ACCIDENTS.

The paper on "Accidents," by Mr. Paul Lupke, was read by Mr. T. C. Martin and resulted in much laughter at its pointed sayings during the reading as well as applause for the writer after its close. The paper was a short one, and concluded with the following paragraphs:

"For the last two years our new-business friends have been working at fever heat. If you do not want their efforts to result in a mere glittering bubble that can be pricked unexpectedly, be sure that you are just a little bit ahead of them all the time. Put your house in good repair before you invite people into it. Do not hang out a gilded sign on a ramshackle shanty. Advertising a plant that has outlived its usefulness is on a par with feeding medicine to a corpse. The strategy of an advertising campaign must be thought out from the coal pile forward. Your high-sounding phrases, your *art nouveau* contortions, your agonized combinations of colors and ideas, will merely invite ridicule if your service is below standard. Remember that 'Good Service' is the name of the solicitor who covers your whole territory every day and calls continuously on all your customers with the one argument that is supreme."

POWER FACTOR CORRECTION BY SYNCHRONOUS MOTORS.

Mr. F. D. Newbury presented a paper pointing out the most important effects of low power factor and showing how in some cases these bad effects may be overcome by the proper application of over-excited synchronous motors. He stated that the power factor in incandescent lighting service, as measured on the supply circuit where small lowering transformers are used, may be taken at about 93 per cent. In series arc lighting circuits where constant current transformers are used, the power factor is from 50 to 80 per cent; under average condition it would be about 70 per cent. With induction motors the power factor would range from 60 to 85 per cent. He called attention to the fact that transformers and induction motors take a practically constant magnetizing current from the circuit so long as the voltage remains constant, quite independent of their load. In induction motors the magnetizing component in kilovolt-amperes averaged 30 per cent of the rating of the motor. In transformers it averaged about 4 per cent. The wattless component of current taken by a synchronous motor may be adjusted to any value within limits by varying the field excitation. If a synchronous motor is connected to a circuit supplying power to induction motors, the leading component of current taken by the synchronous motor when over excited may be adjusted to equal the lagging component taken by the induction motor. Thus it may be considered that the over excited synchronous motor furnishes directly the magnetizing current required by the inductive load. Adding the synchronous motor to the system does not eliminate the magnetizing current entirely from the circuit; it is simply transferred from the main supply circuits to the synchronous motor, which may be considered as a generator.

In order to point out the advantage of using synchronous motors, the author assumed for illustration that a certain station has a load of 1200 kilowatts at a power factor of 70 per cent, and that it is necessary to install a motor-generator set which will have a direct-current load of 200 kilowatts. By the use of a synchronous motor as a part of the motor-generator set, it is possible to raise the power factor of the combined load to 90 per cent in addition to carrying the load of 200 kilowatts. He showed that the total value of the wattless kilovolt-amperes is 1220. The total power component, including all losses, is 1440 kilowatts. It is necessary therefore for the synchronous motor to supply a leading wattless component of 522 kilovolt-amperes in order to reduce the lagging kilovolt-amperes to 698. The required rating of the synchronous motor is therefore the resultant of the power load of 240 kilowatts and the wattless 522 kilovolt-amperes; that is, 575 kilovolt-amperes. If it were desired to raise the power factor to 100 per cent instead of 90 per cent, the rating of the synchronous motor would have to be 1243 kilovolt-amperes.

QUESTION BOX.

The Question Box, by Mr. Paul Lupke, was presented by Mr. Paul Spencer. In presenting this an extract was read from a recommendation made at a recent meeting of the American Gas Institute in reference to the Question Box of that organization. This advocated and recommended a new plan for carrying on the Question Box. This was to submit questions to a standing committee as soon as received. This committee would then, after investigation, either indicate the correct answer to the questioner or, if answers were available in engineering literature, would refer him to the place where the answer could be found. If the case was one requiring the services of a consulting engineer, such a recommendation would be made. If some one member was especially competent to answer the question it would be referred to him. Mr. H. T. Hartman thought that this plan was good but that it would tend to put too much work on a few men. The old plan makes it possible for a large number to contribute to the association. Mr. Spencer said that Mr. Lupke's position was that the Question Box was not now serving the best interests of the association. It left too much to one man, and was too slow in getting answers to questions. A resolution was then passed recommending to the incoming administration that it adopt a plan of conducting the Question Box whereby questions would be answered as received throughout the year. Mr. Alex. Dow in seconding the motion called attention to the fact that frequently questions were asked by members who were novices in the art that had been answered many times years before. He thought such members should be provided with a prompt answer, without too much red tape. The resolution was carried.

INSURANCE.

Mr. W. H. Blood, Jr., insurance expert of the association, then presented his report on insurance and kindred matters. Many changes had been proposed in the National Electrical Code the past year. Of 1000 proposed changes only 100 have as yet been passed. One of the rules proposed dealt with the installation of window lighting equipments which Mr. Blood himself had successfully opposed. He suggested that a committee should be appointed to consider the reclassification of the rules of the National Electrical Code. Electric lighting companies should co-operate with insurance companies by insisting upon the use of the best construction in electric lighting work. Mr. Blood, as insurance expert, stated that he was ready at all times to render service to the association in insurance work, either as insurance engineer or as legal adviser. He had devoted no little time to it the past year. In reply to question by Mr. J. F. Geiser, Mr. Blood stated that the specific rule relating to window lighting which he had opposed would have prohibited the use of all knob and tube work and moulding; and would have required conduit in all cases. As the rules are now worded, however, knobs and tubes or mouldings can be used. In reply to a question as to the attitude of insurance companies on the danger to life element in electric lighting installations, Mr. Blood stated that underwriters' rules were primarily worded so as to eliminate the fire hazard, but they consider that when a life hazard is present there is simultaneously the fire hazard, because cases may arise where the person injured by contact with live wire could have prevented fire. Hence it may be stated that the underwriters favor rules against life hazard as well as fire hazard. As an illustration of this attitude he recited rules relating to the grounding of secondary circuits of transformers.

FIRE HAZARD OF ELECTRICITY.

The committee on the fire hazard of electricity, composed of Mr. C. E. Skinner as chairman, and Messrs. A. A. Pope and H. R. Sargent, submitted a report on certain general information relative to the insurance which had been collected for the purpose of promulgating a better understanding between the asso-

ciation and the underwriting interests. Information was obtained concerning the actual hazard of electricity as compared with other hazards. It was shown that of the total number of fires in New York City during the past five years only 1.31 per cent could be attributed to electricity. In Chicago during the year 1906 there were a total of 3597 fires, 63 of which were due to electricity. A circular letter was sent to each member of the association and to about fifty prominent underwriters and insurance companies, asking for the expression of opinions as to the possibility of there being any hardship entailed on the electric lighting interests by undue publicity given to reports of electrical fires and other questions of a similar nature. To the question outlined above there were 61 answers in the negative and 123 in the affirmative from the members of the association, while there were 13 affirmative and no negative answers from the underwriting interests. A large majority of the answers received from both the association membership and from the underwriters showed that there is a marked tendency on the part of the public to assign electricity as the cause of all mysterious fires.

The committee recommended that the association take action looking towards systematic and uniform inspection throughout the country, this inspection to be based on the *National Electrical Code*, and that each member of the company ascertain, if possible,, the exact facts concerning all fires in its district that may be attributed to electrical causes; to see that, if possible, the exact facts are ascertained and published.

This report was discussed briefly by President Williams, who said that underwriting interests are pleased to know that the association is taking such an active part in insurance matters. And he stated that the interests of the central station companies and insurance companies are mutual in this respect.

TUESDAY—EVENING SESSION.

The Tuesday evening session was opened promptly at 8 o'clock, with President Williams in the chair. The secretary announced that the Postal Telegraph Company had offered free service for all of the delegates to any part of the United States. The Bell Telephone Company offered free service at any time after 6 p. m., while the Washington Telephone Company had installed two booths at the New Willard Hotel for the free use of the delegates for service throughout the city.

UNIFORM SYSTEM OF ACCOUNTING.

The committee on a uniform system of accounting for electric lighting companies, consisting of H. M. Edwards, chairman, and Messrs. A. S. Knight, G. W. Curran, C. N. Jelliffe and Paul R. Jones, presented its report in abstract. The report, the chairman stated, was limited in its scope in order to cover a few branches thoroughly, and to leave to future conventions the task of considering other phases of the subject. It was devoted to the discussion of the following subjects, namely, general accounts, with form of balance sheets; construction accounts, operating accounts, with form of expense report; and income accounts, with form of summary of operation report. More complete summary will appear in a late issue. The committee recommended a close analysis of all disbursements, and carried out that idea in its operating summary, using a few general heads. It stated that there are few things more helpful to the manager than records containing a complete history of past transactions closely analyzed, and exhibiting details of the business. As the company grows these records become more and more valuable, because only by their means can a standard for comparison be obtained. The opinion was expressed that if a uniform system of accounting is ever achieved it will be because all the preliminary records, forms, etc., leading up to the general books of accounts are also uniform, which should also mean that similar operations would be similarly performed everywhere, and would have a like significance wherever they occurred.

The discussion, presided over by H. M. Edwards, chairman of the committee, was opened by Mr. I. B. Smith, who remarked that a uniform system of accounting should conform somewhat to the report suggested. Any system adopted should, however, recognize the Interstate Commerce Commission, because central stations are called upon frequently to arrange their accounts in accordance with the demands of that commission.

Mr. F. L. Dame called attention to the great value of a uniform system of accounting when different properties are to be compared. He suggested that any such system adopted should take cognizance of the system now used by the American Street Railway Association, and it should be arranged on the same basis. He emphasized the importance of separating maintenance from all other items, because the item of maintenance is frequently lost by being absorbed under some improper head.

Mr. C. N. Jelliffe showed that a large portion of the cost of producing electrical energy depends upon the rating in kilowatts of the equipment installed, rather than upon the number of kw-hours sold. He expressed the opinion that the required kilowatt capacity of the equipment is a better basis of cost estimation than the kw-hour sold, which had been suggested in the report. He expressed the belief that the company should be allowed to make use of as many items in its account as it might wish, and not to be tied down to a limited accounting system. Mr. Gulick stated that the adoption of the uniform system of accounting by the National Electric Light Association would have a considerable influence on the requirements of the government with reference to the supervision of accounts.

Mr. Stanley Baker called attention to the elaborateness of the suggested method of arranging the items and expressed the opinion that too many details were taken into account to render the report satisfactory to small lighting companies. The importance of this fact will be appreciated when it is remembered that some lighting companies retain only one man for keeping accounts, attending to new business, for all of the advertising and for the purchasing of new materials.

Mr. Alexander Dow expressed the opinion that the report of the committee is most excellent for all stations, even from the very largest to the very smallest. The larger stations will probably find use for all of the detailed items, while the smaller stations can more conveniently consolidate several items under the general heads. Thus it may be stated that the general classification furnishes an excellent minimum analysis, and upon this minimum the larger stations can enlarge according to the needs in each case.

Mr. Edwards, the chairman of the committee, said that if the National Electric Light Association adopts the system suggested by the present committee, or any other system which it may find desirable, such adoption will have an enormous weight with all committees appointed by the national or State governments, such as the Interstate Commerce Commission, or the Gas and Electric Lighting Commissions. Such was the experience of the street railway accountants when their standard form was adopted. State commissions would in most cases, be glad of a well worked out standard form.

T. F. Wigham thought the size of the recommended form might frighten some smaller companies. E. W. Burdett expressed the opinion that a proper system of uniform and public accounts will go far toward stopping inquisitorial governmental methods of investigation and regulation. It would also establish the stability of the business among investors. Mr. H. T. Hartman favored kw of capacity ready to serve rather than kw-hour output as a basis of cost of service. The public assumes that costs are proportional to output, whereas in most cases they are proportional to capacity of apparatus required.

Mr. C. T. S. Tingley, of the Street Railway Accountants' Association, while complimenting the committee on its report thought it too much at variance in first principles with the standard street railway form in connection with which it must be used in many cases. The street railway form had been adopted by all state commissions save Massachusetts. On motion the committee on standard accounts was continued for another year.

DIFFERENTIAL RATES.

Mr. Geo. Whitefield Betts, Jr., gave an address on Legal Justification of Differential Rates.

He said that electric light business was at first considered in the nature of a private enterprise, but to-day it had all the attributes of a public service. According to the Ohio Supreme Court decisions, as a public service corporation, an electric light company must render impartially like services for like rates. He cited the famous Columbus electric light rate decision which was given in substance in the Electrical World during the summer of 1906. In this decision it was clearly recognized that it cost the company a different amount per kw-hour to serve a customer using current one hour per day than it cost to serve a customer using current several hours per day. In a decision in New York, Armour Packing Company versus Brooklyn Edison Company, it was laid down that like prices must be charged for like services. He then cited the provisions of the Inter-State Commerce law governing railroads, which are to the same effect, and also cited numerous railroad cases where it is clearly laid down that a differential rate based on quantity of service rendered is legally justifiable. The address was mainly given to the question of legal justification of discounts based on quantity only, but little being given to discounts based on maximum demand and number of hours use of that demand.

Mr. Freeman, of the Brooklyn Edison Company, explained in detail the suit for discrimination which had been brought by Armour & Company. The counsel for the Edison Company claimed that Armour & Company had no cause for action because it had entered into a contract with the lighting company. This contention was upheld by one court, and from this court Armour & Company appealed. The final decision of the court has not yet been given, and the case must again come up for trial. Mr. Freeman expressed the opinion that the most important problem from the point of view of the central station relates to the contention of the customer that he is being unduly overcharged when the rates are changed and his bills are higher than they would have been under the old rates.

Mr. J. F. Geyser described at some length the method of charging for electrical energy which is in use at Waynesboro, Pa. According to this method the rates depend not only upon the hours of use of the maximum demand, but also upon the total quantity used. Thus, although the consumer of a large amount of energy pays a much less rate than the consumer of a less amount, the schedules of rates is the same for the one as for the other, for similar service and there is no discrimination in rates.

LIGHTNING PROTECTIVE APPARATUS.

The last paper of the session was one entitled "The Recent Developments in Protective Apparatus," by Mr. D. B. Rushmore, which, in the absence of the author, was read in abstract by Mr. Duboise. This paper classified the lightning phenomena and recommended certain methods of placing lightning arresters throughout the system in order properly to protect the apparatus. After giving an outline of the theory upon which lightning arresters are based the author described the recently developed graded resistance type of arrester. In this arrester three shunted resistances are used in connection with the series of non-arcing gaps. The principal advantage of this type of arrester resides in its ability to protect the apparatus from low-frequency surges, and it thereby overcomes the most serious fault of the motor-gap arrester. The paper described the aluminum cell arrester, which was developed by Professor Creighton. This arrester is similar in construction to a battery and consists of two aluminum plates immersed in certain electrolyte. The cell acts as an almost infinite resistance for voltages below a certain value, but allows current to pass freely when this voltage is exceeded. A description was given of the liquid electrode arrester which was mentioned in a paper presented by Professor Creighton at the March, 1907, meeting of the American Institute of Electrical Engineers.

WEDNESDAY MORNING.

Upon the opening of the session of Wednesday morning, Dr. S. W. Stratton, director of the Bureau of Standards, cordially invited the members to visit the Bureau during their stay in Washington. Papers were then presented by Messrs. George M. Little, E. L. Elliott and Henry Floy.

THE METALLIC OXIDE ARC LAMP.

In his paper on new developments in arc lamps and high efficiency electrodes, Mr. George M. Little stated that the electrodes used in the so-called magnetite arc lamp contained, in addition to the oxide of iron, the oxides of titanium and of chromium. In the manufacture of the electrodes the mixture of oxides is tamped into a thin iron tube and the ends are sealed by the use of an electric arc. The titanium oxide has the property of rendering the arc luminous, while the oxide of chromium prevents a too rapid consumption. In comparison with the carbon arc, the magnetite arc has a much higher efficiency. When operated with four amperes at from 65 to 75 volts at the arc, it will produce a light equal or superior to that of a 6.6-ampere 75 volt, direct-current enclosed carbon arc lamp.

The characteristic property of the magnetite arc has been a very noticeable dying down or dimming of the light, which occurs at regular intervals, especially after the electrodes have burned for 20 hours or more. These dim periods last from a few seconds to three minutes, after which the normal brilliancy returns. This action is explained as follows: In the arc the brilliancy is due largely to the presence of volatilized oxide of titanium, and anything that interferes with the uniform evolution of vapors of titanium will cause the light to become dim The oxide of chromium volatilizes at a slower rate than that of titanium and iron, and after 20 hours or so the slag on the end of the cathode becomes very rich in chromium. The deposit stops the evaporation of titanium and iron and the light turns to a bluish color and dies down until the chromium film is burned away. This trouble has been met by modifying the mixture in such a way that the oxide of chromium could not separate from the oxide of iron and titanium, thus doing away with the film on the surface and entirely eliminating the dim spells.

The magnetite electrodes are volatilized bodily, leaving a reddish soot that settles on everything it touches, so that a chimney is a very necessary feature in the lamp. An examination of the constructive details of present magnetite lamps shows that they are simple and rugged as no float feed is used; it being necessary merely to strike an arc and hold the electrode in a permanent position until, due to change in voltage, the cut-out ceases the reconstructing of the arc. The lamp consists essentially of a base and a top connected by a chimney; a set of magnets for striking the arc; a shunt cut-out for causing the lamp to feed when the voltage arises, and a series cut-out for disconnecting the striking magnets after the arc has been formed. Arrangements are made so that the draft of air which strikes the arc travels in a downward direction around the electrode, a special down draft tube being used for this purpose.

CANDLE-POWER IN MUNICIPAL CONTRACTS.

With the title "Indefinite Candle-Power in Municipal Contracts," Mr. E. L. Elliott presented a paper in which, after giving some account of the Colorado Springs arbitration, the following recommendations are made:

If the term "candle-power" is to be used at all, its exact meaning as used in the particular contract should be carefully defined. Illumination, measured in foot candles, is a more scientific, exact and generally satisfactory basis for a contract than light. The watt consumption of a lamp should never be used as the measure of its light giving power. Every lighting contract should be examined and made by a compentent illuminating engineer.

INDEFINITE OBLIGATIONS IN MUNICIPAL CONTRACTS.

Mr. Henry Floy in a paper with the above title, after discussing various details of the subject, recommended that a company entering into a contract with a municipality should work along the following lines:

First, have a clear understanding with the party to the contract as to exactly what the contract is to cover. Second, see

that the wording of the contract is exact, with a tendency toward repetition and too full explanation rather than brevity and omission. Third, maintain good feeling and confidence throughout the life of the contract, even at the sacrifice of some profit. Fourth, keep a set of records of daily output, including line loss, leakage, etc. (but remember it is light not wattage that is being sold), so that at any time one is prepared to go into court or before arbitrators and prove his case; but such procedure is not to be followed except as a last resort.

EFFICIENCY OF VARIOUS METHODS OF ILLUMINATION.

Mr. Edward A. Norman reported the results of a series of tests made by the Electrical Testing Laboratories in the Harlem branch office of the New York Edison Company, illuminated by means of cove lighting and Holophane clusters; and also in the drafting room of the New York Edison Company, at 55 Duane Street, lighted by diffuser arc lamps. A summary of these tests was given on page 540 of our issue for March 16, 1907.

STREET LIGHTING SPECIFICATIONS.

The committee to consider specifications for street lighting, consisting of Mr. Dudley Farrand, chairman; Drs. A. E. Kennelly and C. P. Steinmetz, and Messrs. L. A. Ferguson and Paul Spencer, reported the following recommendations:

1. Under ordinary conditions of arc lighting, with lamps spaced 200 ft. to 300 ft. apart, specifications for street lamps should define the mean illumination thrown by the individual lamp, in position in the street, as measured at the height of the observer's eye and perpendicular to the rays, at some point not less than 200 feet nor more than 300 feet distant, along a level street, from a position immediately below the lamp, with all extraneous light screened off and with no reflection from surrounding objects not forming part of the lamp equipment. (The reason for leaving the horizontal distance flexible along the street within the range between 200 and 300 feet, is that a definitely specified distance such as 250 feet, might be unsuitable for the purposes of the measurement. With the horizontal distance in excess of 200 feet, the distance correction for the height of the lamp above the observer's eye is ordinarily unimportant.)

2. When using smaller units of light, such as series incandescent lamps spaced shorter distances apart, a correspondingly shorter distance from the lamp should be chosen in measuring the illumination.

3. The lamp contracted for should give a mean normal illumination at the test point (selected as in Sections 1 and 2) not less than the illumination given by the stationary standard incandescent lamp of 16 candle-power at $1/x$ of the distance. The said standard incandescent lamp should be a standardized seasoned lamp having a determined candle-power in a fixed direction.

4. When the lamp tested fluctuates in intensity, a number of observations of the maximum normal illumination should be made at a distance of not less than 200 feet horizontally from beneath the lamp, and the average of these measurements should be taken as the average maximum illumination. A similar number of observations of the minimum normal illumination should be made, the average of which should be taken as the average minimum illumination. The arithmetical mean of the said average maximum and minimum illuminations should be taken as the mean normal illumination called for in Section 1.

a. When a reading-distance instrument is used for measuring the mean normal illumination at specified horizontal range, the average of a number of maximum distances at which a certain size of print can be distinguished may be called the average maximum distance, and the average of a similar number of minimum distances the average minimum distance. From these, the mean distance at which an illumination is cast normally, sufficient for distinguishing that size of print can be determined. This mean distance must lie within the 200-300 feet horizontal range specified in Section 1. In most cases the arithmetical mean of the average maximum and average minimum distances may be taken as the said mean distance with an accuracy sufficient for practical purposes. The illumination needed for distinguishing the size of print may be determined for each particular observer from measurements of the reading distance with the standard incandescent lamp referred to in Section 3.

b. When a portable photometer is used at a fixed horizontal distance, such as 250 feet, the mean normal illumination of a fluctuating lamp may be obtained by taking the average of not less than 50 observations at intervals of not less than one-half minute.

5. A reasonable number of lamps covered by the contract should be tested.

6. For measuring the mean normal illumination of a lamp, comparison with the standard incandescent lamp may be made either with a suitable portable photometer or with a reading distance instrument, such as the so-called "luminometer."

7. The unobstructed mean normal illumination must not be less at shorter distances than at the point of test.

8. An approximate list of the mean normal illuminations thrown by street lamps of standard manufacture, at horizontal distances within the 200-300-ft range, hung approximately 20 ft. above the level of the observer's eye, will be added later in a table, to form this section.

In the discussion on the papers of Messrs. Elliott and Floy and the Report of the Committee on Street Lighting, Dr. C. P. Steinmetz stated that a new metallic oxide lamp of the magnetite type would shortly be placed upon the market. He considered that the present carbon filament incandescent lamp would soon be superseded and that the open arc lamp is a thing of the past. The highest efficiency and the best results will be obtained from the metallic filament incandescent lamp and magnetite arc lamp. He was of the opinion that contracts for street lighting should always recognize total illumination, and not merely the number of lamps.

After a very full discussion the convention adopted the report of the committee on Street Lighting Specifications based on illumination.

New Telephone Patents.

INTERCOMMUNICATING SYSTEM.

An intercommunicating system and switch box are described in a patent granted to L. P. Müller, of Passaic, N. J. The switch springs are operated by locking pushes. Three batteries and five battery wires are required, besides the individual station wires.

Mr. A. A. Monson, of Minneapolis, has patented an automatic system sender in which the user must set up his number by a turn of his dial knob in one direction, and then send his number by a reverse movement to zero. This insures a zero setting at the end of each call. This same inventor has patented an automatic exchange system in which each selector serves a small group of subscribers. There is a control magnet for each line which prevents interference of one subscriber with the other, the first one calling obtaining control until his conversation is completed. Arrangements are such, however, that calls may be received for any line at any time that particular line is not busy, irrespective of its section apparatus.

PROTECTIVE DEVICES.

R. B. Hewitt and J. G. Nolen, of Chicago, have patented a rather novel thermal device, their patent being assigned to F. B. Cook. They include their heating coil in a close air chamber, and the expanding air causes one side of the chamber, this side being a flexible diaphragm, to deflect to control the circuits.

Still another protective device is embodied in a patent granted to R. R. Burrin and T. F. Gaebler, of Rockville, Indiana. A metal box with removable cover is provided, an ear carrying a knob insulator, projecting from each end. The protector is enclosed in the box, and the whole serves as a wiring cleat

or arm. The protector terminals are led to binding posts mounted upon the box walls.

AUTOMATIC EXCHANGE.

There have been two general principles used in working out automatic exchanges. One of these provides each incoming line with an individual selector mechanism which responds to its own line only and which begins the process of making a connection. The other system employs one mechanism for a group of lines and its first movement must be to select the calling line. Thus the process of making a connection can only take place for one line of the group at a time, although of course several connections may exist simultaneously.

A sort of hybrid system forms the subject of a patent granted to F. Merls, of Berlin, Germany. In this, the group system is used, but the primary group apparatus is only held long enough to start the switching process, a selecting apparatus of the Strowger type being used to hunt the calling subscriber and connect him with the usual Strowger series of machines. This scheme greatly reduces the number of machines required per 100 subscribers. For example, in the four digit, or 10,000 Strowger, one selector is required for each line, and to this must be added 10 switching selectors and 10 connecting selectors for each 100 lines, or in all, 120 machines per 100 lines. Now with the hybrid system, one group switch and its corresponding relays with 10 calling line or pre-selectors with 20 switching and 10 connecting selectors serve per 100 lines. As it is claimed that the group switch relays, etc., are about equivalent in cost and complication to 10 machines, a saving of 70 machines in 140, or 50 per cent, is effected. This is a material gain and if it works out successfully in practice should have considerable effect upon the automatic situation.

SWITCHBOARD CIRCUITS.

In a switchboard patented by H. G. Webster, of Chicago, and assigned to the Stromberg-Carlson Company, the cord circuits of the two-wire type are free from any source of signalling current. The supervisory relay is of high impedance and is bridged across the two strands. When a cord is in use, the battery fed upon the line splits between the subscriber's line and instrument, and this supervisory relay. In this condition, the supervisory relay is shunted and fails to come up. When the line is opened by the return of the receiver to the hook, the supervisory relay gets more current and comes up to light its lamp.

A party-line system of the four-station selective variety has been patented by Garrison Babcock, of Chicago, and also assigned to the Stromberg-Carlson Company. In this system two of the stations are rung metallic with pulsating currents and two are rung from both sides of the line in parallel to ground with these currents. The bridge at these stations is through a split impedance coil so that there is no shunting of the talking currents. At central each line has two jacks and two signals, and at the stations there are switches such that any one may call any other station, or may talk over the grounded phantom circuit used normally for ringing.

Another ringing circuit is that patented by A. R. Kahl, of Rochester, N. Y., this patent also going to the Stromberg-Carlson Company. This is a machine-ringing system, there being a double control of the ringing circuits. Interrupters supply the current in properly timed impulses to the terminals of a ringing relay. This ringing relay applies the current to the line, being itself controlled by an interrupter, so set that the line may become discharged before being reconnected through after ringing, and thus avoiding sound shocks toward the calling stations.

Two patents for special trunking circuits have been recently granted and assigned to the Kellogg Switchboard & Supply Company. Both these patents are for features applicable to the particular switchboards with which they are to be used. W. W. Dean and H. G. Webster are the respective inventors.

NEW INSTRUMENTS.

A telephone set small enough to fit in a pigeon-hole is rather a novelty, but such is the set patented by A. K. Adriano, of San Francisco, his patent being assigned to the Direct Line Telephone Company. The set comprises a selective switch, a hook switch and transmitter and receiver. The transmitter serves as a thumb nut to turn the selective switch, and it forms the front of the box. The receiver hook projects out over the transmitter in a manner to hang the watch-case receiver concentric with the transmitter, so that the two mouth pieces come together.

W. A. Beavan, of Philadelphia, is the inventor of a receiver support for desk stands. This is formed up out of wire. One end clamps under the transmitter-clamping screw, and the other is formed out to provide a horizontal rest for the receiver at the proper height for the ear. Heretofore all receivers have had a diaphragm, magnetic either wholly or in part, but A. F. Davis, of Oakland, Cal., has now patented a receiver with a metallic non-magnetic diaphragm. His theory is that the action occurs between Foucault currents set up in the metal and the poles. The receiver is not supposed to be sufficiently sensitive to compete with the usual receiver, except where the disturbances upon the line are of considerable magnitude. In such a case it is claimed that this receiver seems to differentiate in favor of the voice current.

A breast transmitter forms the subject of a patent to J. A. Birsfield, of Rochester. The patent concerns the details of construction, referring particularly to the casing. This is of two disk-shaped parts, one placed inside the other so that an air space exists between their bottoms and so that their side walls form an annular groove. This registers with a flange of the base plate to form a tight, stiff box. This patent is assigned to the Stromberg-Carlson Company.

In Fig. 1 is shown a jack strip patented by F. R. McBerty and E. B. Craft. At the left is shown a punching from which the jack thimble is formed up, and upon which the whole

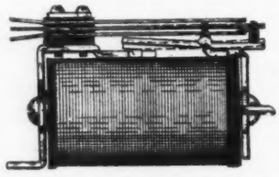


FIG. 1.—BIRSFIELD CIRCUIT CHANGING APPARATUS.

spring system of the jack is built up. In forming up this part two stiff legs are arranged so that there is no other connection required between the face and rear parts of the strip. The Western Electric Company has been assigned this patent.

Two new relays have recently been patented, both patents being assigned to the Stromberg-Carlson Company. W. Kaisling, of Chicago, is the inventor of a polarized relay in which a core is pivoted to swing between the legs of a U-piece. The winding surrounds this core and may or may not swing with it. The U is capped by a permanent magnet. The core

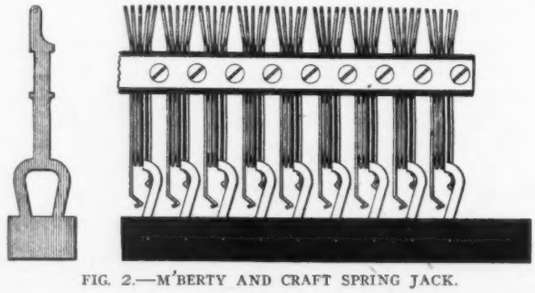


FIG. 2.—M'BERTY AND CRAFT SPRING JACK.

swings from side to side under the combined influence of its coil and the magnet, and makes and breaks such contacts as desired. One feature is a brake which acts in one direction only. This brake is a magnetic piece secured to one pole of the polarizing magnet. When the polarity of the tongue core

is opposite, the brake bears upon it; when like, it repels it. The relay is therefore sluggish in one direction.

The relay of J. A. Birsfield approaches more the standard form. An L-shaped pole piece is secured to each end of the core and these approach each other. The armature rides up the upturned edge of one of these and spans the air-gap. The armature is pivoted about its middle, the front extension carrying insulating studs which drive the spring contacts. Figure 2 shows this relay. A polarized drop has been invented by K. Weman, of Buffalo, which will respond only to steady and pulsating direct currents of proper polarity. There are two windings, one short-circuited. The induced currents in this produce counter effects such that only the correct current will affect the armature.

LETTERS TO THE EDITORS.

Simplified Spelling.

To the Editors of Electrical World:

SIRS—I have read with interest Mr. Waring's letter in your issue for May 25, and your statement of your own attitude toward simplified spelling.

No one can quarrel with your intention to "adhere to the spelling which has the sanction of general good usage." But good usage varies widely; and no two dictionaries agree. May I suggest that those who believe that our noble tongue should be kept fit for service and that the simplification (by the omission of useless silent letters), which has been operative for centuries, should continue to operate in the present, may help along the good work by adopting now the simplest spelling which has the sanction of a good dictionary.

At present the Standard Dictionary is somewhat in advance of the Century, as that is somewhat in advance of Webster. (Worcester's Dictionary has been abandoned, so I understand.) Let us go as far as the Standard now; and when either the Century or Webster appears in a new edition, let us go as far as this shall go—which is certain to be in advance of the present edition of the Standard.

Perhaps some of your readers will be glad to learn that they can receive its various publications by addressing a postal card to the Simplified Spelling Board, 1 Madison Avenue, New York.

COLUMBIA UNIVERSITY, NEW YORK. BRANDER MATTHEWS.

The Plotting of Speed-Time Curves.

To the Editors of Electrical World:

SIRS—In reference to Prof. Langsdorf's article on "The Plotting of Speed-Time Curves" in your issue of May 18, I venture to suggest a modification of his method which I employed on a similar problem some time ago. It is required to derive the speed-time curve from data giving simultaneous values of velocity and acceleration. In the modification mentioned the necessary integration is performed with respect to v instead of with respect to a, thus leaving out the first step of Prof. Langsdorf's method and eliminating the apparently greatest source of graphical inaccuracy.

Using the same notation, from the equation

$$a = \frac{dv}{dt} \qquad (1)$$

we have

$$dt = \frac{1}{a}\,dv \qquad (2)$$

and thence

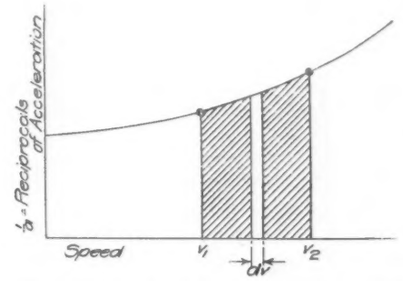
$$\int_{t_1}^{t_2} dt = \int_{v_1}^{v_2} \frac{1}{a}\,dv = t_2 - t_1 \qquad (3)$$

To determine the value of the righthand integral, from the given data a curve is plotted with simultaneous values of the velocity and *the reciprocal of the acceleration*. The integral then represents on this curve the area between the values v_1 and v_2 of the velocity and is equal to the elapsed time, which result is similar to that of Prof. Langsdorf.

SCHENECTADY, N. Y. L. A. HAZELTINE.

To the Editors of Electrical World:

SIRS—In connection with the article on the plotting of speed-time curves in your issue for May 18, 1907, by Prof. A. S. Langsdorf, the method outlined by the writer some years ago may be of interest at this time.*



RELATION OF SPEED TO THE RECIPROCAL OF ACCELERATION.

From the relation (following the notation of Prof. Langsdorf's article)

$$a = \frac{dv}{dt} \qquad (1)$$

where a = acceleration in miles per hour per second
v = velocity in miles per hour
t = time in seconds.

Then

$$dt = \frac{dv}{a} \qquad (2)$$

Or

$$t = \int dt = \int_{v_1}^{v_2} \frac{1}{a}\,dv \qquad (3)$$

That is, if values of $\frac{1}{a}$ are plotted against speed, v, the area between the curve and the axis of v is the elapsed time between velocities v_2 and v_1 as shown in the accompanying diagram.

The uncertainty of drawing tangents, as in Prof. Langsdorf's article, can thus be avoided. Indeed, the equation given by Prof. Langsdorf,

$$dt = \frac{dv}{\frac{da}{a}\,.\,da}$$

reduces at once to

$$dt = \frac{dv}{a}$$

The main objection in practice to the use of either of the above methods lies in the necessity of drawing an auxiliary curve, as was explained by Mr. C. O. Mailloux in the *Transactions* of the American Institute of Electrical Engineers, Vol. 22, pp. 166-174.

NEWARK, DEL. L. A. FREUDENBERGER.

* ELECTRICAL WORLD AND ENGINEER, July 18, 1903, pp. 96-97. Idem. Aug. 9, 1903, pp. 219-221.

Great Falls Electrical Development.

To the Editors of Electrical World:

Sirs—Let me call attention to certain criticisms in your editorial of May 25, relating to the transmission lines of the Southern Power Company.

The statement that the lightning conductor is solid is an error. Our lightning conductors, both on wood pole lines and steel lines, are 9-32-in. Siemens-Martin strand (6 x 7 haulage) and will withstand a pull of 4300 lbs.

We are not erecting anything, that the writer knows of, because it is "novel and attractive in appearance." The trunk line from Great Falls to Catawba will carry only 20,000 kilowatts at 85 per cent power factor, and 44,000 volts, delivered with a drop of 13.5 per cent and a loss of 7.75 per cent; and as the three plants in the neighborhood of Great Falls, to say nothing of the two plants a few miles further down the river, will have an ultimate rating of 65,000 kilowatts, it is evident that we will require two lines, and perhaps three, of the twin towers referred to.

If the amount of power to be carried over these trunk lines was only that of the Great Falls plant, we are of the opinion that single lines should have been built; but looking at the question with a view to the ultimate capacity, the cost of foundations and rights of way of six single lines is a factor which cannot be overlooked.

Charlotte, N. C. J. W. Fraser,
Assistant Chief Engineer.

DIGEST OF CURRENT ELECTRICAL LITERATURE

Dynamos, Motors and Transformers.

Design of Alternators as Influenced by the Rated Speed.—H. M. Hobart and A. G. Ellis.—The second article of their illustrated serial on this subject. This instalment deals with machines of moderately large rated output, and considers the case of a 3000-kilo-volt-ampere, 11,000-volt three-phase alternator for various speeds, and corresponding numbers of poles for 25 and 50 cycles. The general conclusion drawn is that the cost and quality of the design does not depend so much on the actual rated speed as on the number of poles associated with the speed. An interesting point brought out is that in the case of 25-cycle machines of the above output there is no saving in cost obtained by adopting a two-pole design for 1500 r. p. m. over the four-pole for 750 r. p. m. while the latter is preferable from both electrical and mechanical standpoints.—Lond. *Elec. Eng'ing*, May 16.

Commutation.—H. Linsenmann.—The differential equation of the short-circuit current curve of a direct-current armature has been repeatedly discussed and solved by analytical means, which, however, are somewhat complicated for the average engineer. The present author gives two graphical methods for solving the same differential equation. The first method is applicable to more general differential equations than necessary for the problem itself and it comprises the second method as a special case. The second method gives the same accuracy for practical purposes as analytical calculation and requires less time and work, and no special mathematical training.—*Elek. Zeit.*, May 16.

Induction Motor.—G. Haverland.—An illustrated paper on the diagram of the induction motor. If when the rotor is stationary, from measurements of the voltages and currents of the primary with the secondary, both open and closed, a diagram may be plotted which gives at once the current locus by means of a simple geometrical construction. The above measurements, in connection with a no-load test, are practically sufficient for constructing the current diagram.—*Elek. Zeit.*, May 9.

Lamps and Lighting.

The Thermal Equivalent of the Light from Tests of Incandescent Lamps.—W. Voege.—A note referring to the recent article of J. Russner, who determined the ratio of light to heat radiation of electric incandescent lamps by absorbing the dark heat rays in a solution of ferrous ammonium sulphate. The author made similar experiments a few years ago and found a higher precentage for the light rays with carbon-filament lamps, osmium lamps and Nernst lamps than was found by Russner. The reason for this may be that the dark heat rays were not completely absorbed in his experiments in the layer of water through which they passed, although this layer was quite thick. The author thinks, however, that the absolute values of the ratio are not of as much importance as are the relative values obtained for different lamps. He then criticizes one conclusion of Russner who had calculated the power in watts corresponding to one hefner candle of the light of each of the different incandescent lamps and had claimed that if the experiments were exact, the power per hefner candle should have the same value for all lamps. The present author strongly objects to this conclusion. It would be correct only if the light radiation of all the lamps depended solely on the temperature and if they all were tested at the same temperature. But especially with respect to the last point the different lamps differ greatly from each other. The higher the temperature the more is the maximum of the radiant energy curve displaced toward smaller wave lengths; in other words, the yellow and green rays will gain more and more in intensity compared with the red rays. The yellow and green rays, however, are those which produce mainly the physiological effect on the eye, while the red rays determine in the first line the heat effect of the light. With increasing temperature the ratio of light radiation to total radiation increases, but the physiological effect of the light rays on the eye increases still more rapidly. If one determines optically the candle-power of two lamps and calculates the heat equivalent of one hefner candle from the percentage of the power transformed into light, this value will be found smaller for that source of light which is at a higher temperature. It is indeed possible to use the heat equivalent of light found in this way to see what the color of the light is. He found the following values for the heat equivalent of light: 0.060 gram calories per second for a carbon-filament lamp operated at 5 watts per hefner candle; 0.048 for carbon-filament lamps operated at 3 watts; 0.040 for carbon-filament lamps operated at 2½ watts; 0.026 for osmium lamps; 0.024 for Nernst lamps.—*Phys. Zeit.*, May 1.

Leading-in Conductors for Electric Lamps.—C. O. Bastian.—An abstract of a paper read before the Glasgow Section of the (British) Institution of Electrical Engineers on a method of avoiding the platinum leading-in wires in electric incandescent

FIG. I.—LEADING-IN CONDUCTORS.

lamps. Nickel and steel can be alloyed in such proportions as to have practically the same coefficient of expansion as glass, but when such an alloy has been used for leading-in wires it has been found that the surface of the wire becomes oxidized

during the sealing-in process and the thin layer of oxide is sufficiently porous to allow air to gradually percolate through, so that lamps made with this nickel-steel alloy cannot be stocked for any reasonable length of time without deterioration. The new leading-in wire described in the paper was invented by G. Calvert and is a copper wire of sufficient length to extend from the lamp cap to the filament. Near one end and along 15 mm of its length this wire is rolled flat to a thickness of 0.075 mm as shown in the left-hand diagram of Fig. 1. Next a 10 mm length of soft enamel glass tube is slipped over the flattened portion of the conductor, and is melted on to it with a blow-pipe flame. If this blow-pipe flame is properly applied under suitable conditions, the enamel glass can be melted on to the flat copper without the latter oxidizing. "The enamel and copper appear to be actually joined together—amalgamated, as it were, one with the other—and not merely in juxtaposition. This glass coated metal can now be heated up to any desired temperature short of the melting-point of the copper, without the latter becoming oxidized, because the glass coating will effectually prevent the access of oxygen to the surface of the metal underneath it." There is, therefore, nothing to prevent conductors thus prepared being sealed into a lamp stem, as shown in the right-hand diagrams and such seals have proved most perfect in practice, and have successfully withstood the very severe tests to which they have been subjected during the last eight months. Although obviously the copper has not the same coefficient of expansion as the glass, the flattening of the wire increases the proportion of surface area to mass, and the strain on the glass due to the expansion of the copper is less at any point when the copper is in strip form than if the copper were a cylindrical wire of equal cross-sectional area. As the proportion of the surface area to mass of copper is increased, so is the cracking strain of the copper upon the glass reduced, and if the copper is flattened below the point of critical thickness, then no cracking will result. For the lead glass usually employed by lamp manufacturers, this critical thickness has been determined by experiment at about 0.1 mm and with this gauge of copper about 50 per cent of the seals will crack, but below this gauge—0.075 mm—no cracking whatever takes place, even though the projecting copper wire be raised to a red heat close up to the glass. As a further advantage of the flattening of the copper it is stated that the rolling forces out some of the occluded gases.—Lond. *Elec. Eng'ing*, May 16.

Power.

British Power Company.—An illustrated article on the Kent Electric Power Company which is a new British company preparing to give a power supply in bulk. It has opened its first power station at Findsbury from which it is proposed to supply power over an area equal to a circle of 12 miles radius. The greater part of the load is expected to be in the immediate vicinity of the generating station. The chief industry in the neighborhood is cement making. The generating plant at present installed in the engine room consists of three Parsons turbo-alternators, one being a 500-kw set, running at 3000 r. p. m. and the other two each nominally 1500 kilowatts when running at 1500 r. p. m. The 500-kw set generates three-phase currents at 2400 volts which is transformed to 11,000 volts. Although the plant capacity is nominally only 3500 kilowatts, yet provision has been made for at least 100 per cent overload. The voltage of the larger sets is 11,000. The specified conditions of test of the 1500-kw sets were 150 degrees F. superheat and a vacuum of 27.5 in. The test was, however, carried out at 128 degrees superheat and 25.79 in vacuum. After making the necessary corrections for these, the steam consumption under specified conditions was as follows:

Full load.....	17.5	lb. per kw-hour.
Three-quarter load.....	18.54	lb. " " "
Half load.....	19.7	lb. " " "

It is the intention to install a battery for use in emergency for lighting the plant and also for excitation purposes. Maximum-demand indicators are being installed on the motor circuits.—Lond. *Elec.*, May 10 and 17.

Electric Power in Cement Works.—An illustrated description of a British cement works which is the first to have installed electric motors for all purposes throughout the works. The installation is very successful. Induction motors are used throughout and except three 50-hp machines they are provided with wound rotors and slip rings so that resistance can be introduced into the rotor circuits when starting. The aggregate capacity of the motors is nearly 1100 hp.—Lond. *Elec. and Elec. Rev.*, May 17.

Blast Furnace Gas Power for a Central Station.—A note stating that La Société des Forges d'Eich is installing at Dommeldingden in Luxemburg a central station which will be worked by blast-furnace gas. A contract has been made for a term of 15 years with the town of Luxemburg for the supply, for lighting and other industrial purposes, of all the energy over and above that necessary for the society's own needs. The price is fixed at 1.4 cents per kw-hour for the first 2,000,000 kw-hours and 1.2 cents per kw-hour after. The cost of generation is estimated at 0.5 cents.—Lond. *Elec.*, May 3.

Wind Power.—W. O. HORSNAILL.—The conclusion of his article on the generation of electricity from wind power. A comparison of cost is made of a wind-mill installation with an oil-engine installation and it is found that the cost is less for the former. Moreover, it does not require the occasional skilled attention necessary to the satisfactory working of an oil engine. Some references are finally made to existing wind electric plants.—Lond. *Elec.*, May 10.

Turbo-Alternators.—An account of a test of one of the four 3500-kw Parsons turbo-alternators in a British power station.

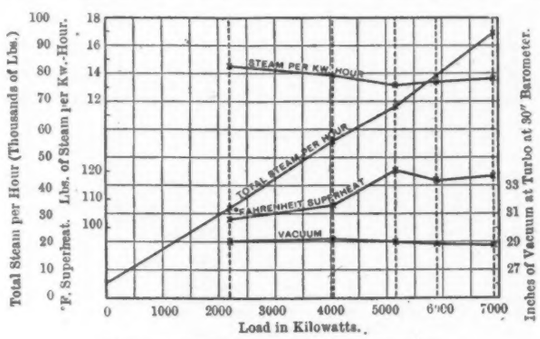

Total Steam per Hour (Thousands of Lbs.)
°F. Superheat. Lbs. of Steam per Kw.-Hour.
Inches of Vacuum at Turbo at 30" Barometer.
STEAM PER KW-HOUR
TOTAL STEAM PER HOUR
FAHRENHEIT SUPERHEAT
VACUUM
Load in Kilowatts.

FIG. 2.—TESTS OF TURBO-ALTERNATORS.

The trials were made after the machine had been at work for over six months, and "the result obtained, namely, 13,189 lbs. of steam per kw-hour, is certainly remarkably good, and most probably establishes a record." The general results of the tests are plotted in Fig. 2.—Lond. *Elec. Eng'ing*, May 16.

Traction.

Single-Phase Versus Direct Current for Traction.—H. M HOBART.—A discussion of the relative advantages and disadvantages of single-phase traction compared with direct-current traction. The author is completely in favor of direct-current traction and his arguments may be summed up as follows: In the operation of main railroads with alternating current the voltage in the trolley wire cannot be less than 8000 or 16,000, otherwise the voltage drop in the rails used for the return current would be too high. The voltage at the single-phase motor cannot well be above 350 since otherwise the commutation will be so poor and the space coefficient of the field-magnet winding so small that a bad effect would be produced on the efficiency, on the heat conditions or on the speed. If there is not sufficient space for the insulation the danger of the field coils breaking down is increased. On account of the great difference between the trolley voltage and the motor voltage, transformer apparatus must be provided on the train and these, together with other necessary auxiliary apparatus, cause the weight of a single-phase equipment to be at least twice that of a direct-current equipment for the same power. Since a very low voltage is required at the commutator of the single-phase motor, the commutator becomes large, heavy and expensive.

A large contact surface for the brushes is required and their renewal is expensive. Commutation troubles will nevertheless occur. On account of the large currents supplied to the brushes the commutation losses will be high and this will contribute to lowering the efficiency of the single-phase motor. When the motor starts slowly from rest, a strong current is induced in the short-circuited armature coils which are thereby heated up to a dangerous temperature. On account of the higher speed of the single-phase motor the ratio of gearing must be larger. This diminishes the efficiency and causes the gearing to be more quickly worn out. Another particular disadvantage of the single-phase motor is the relatively low tractive force at which the wheels begin to slip. The total tractive force is larger with a direct-current system if the same power is assumed for the motors. The starting torque is the better the higher the frequency; on the other hand, the operation of single-phase motors is poorer in other respects the higher the frequency. "It is difficult to say at which frequency the operation of single-phase motor is the least unsatisfactory. At zero periodicity, that is for direct current, we have none of these difficulties. The day will come when enough time and money has been spent for experiments with single-phase motors and when the opinion will be quite general that the direct-current motor is superior to the single-phase motor for traction purposes. It is a different question whether the direct-current motor will also maintain its superiority over the three-phase motor for the electrification of main roads."—*Elek. und Masch.*, May 12.

Suspension of Motors.—Marchema and Mazen.—Two papers presented before the International Society of Electricians in Paris on methods of suspending motors on cars and methods of gearing them to the driving wheels.—*La Revue Elec.*, May 15.

Underground Railway in London.—An illustrated description of the newly opened extension of the City and South London Railway from the Angel as far as Euston, about 1¼ miles in length. The new generating plant for this extension consists of two 300-kw, 500-volt generators.—Lond. *Elec. Eng'ing*, May 16; Lond. *Elec.*, May 17.

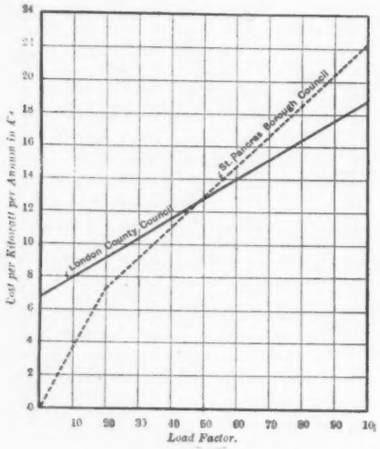


FIG. 3.—POWER SUPPLY CURVES.

Electric Ambulances.—An illustrated description of the new electric ambulances of the city of London. The battery on the car consists of 45 pasted cells. The total weight is about 1000 pounds and the capacity is about 135 ampere hours. The positives have a life of about 12 months or more. In connection with the scheme a complete telephone call system has been established.—Lond. *Elec.*, May 17.

Installations, Systems and Appliances.

Electric Power Supply in London.—R. L. Pearson.—The conclusion of his long illustrated serial. A brief consideration is given of the financial aspect of electric power supply in London as a whole. Fig. 3 shows how the charges set forth in the London County Council bill compare with those at present in vogue. The cost per kilowatt per annum is plotted against load factor, one curve representing the L. C. C. rates and the other those at present used in the Borough of St. Pancras. For load factors of less than 50 per cent the St. Pancras rates are the more favorable to the consumer, but between 50 and 100 per cent the L. C. C. rates are to be preferred. However, it is practically certain that the bulk of the motor load in London is of such a nature as to work out at less than 50 per cent. Instances of load factors greater than this are comparatively rare. The L. C. C. curve is based on an initial charge of £6.15s. per kilowatt demanded plus 0.33d. per unit for all energy consumed. Such energy would be measured on the consumer's side of any transforming apparatus and would be supplied in form of continuous current. The cost of transforming, too, would be borne by the Council. Tables are then given, showing the variation in prices per kw-hour obtained by private companies and municipal stations in London during the last ten years. The amount received by the various undertakings for every kw-hour sold has been gradually reduced. The City of London Company received 13 cents per kw-hour in 1895 and 5.46 cents 10 years later. The average price obtained last year by the Charing Cross Company in the city area is even lower, being 5.34 cents. For municipal undertakings the prices received are lower than those of the companies. Last year the average price in Stepney was only 3.34 cents, the lowest in London. The hope is expressed that the central station supply business in Great Britain will be left undisturbed for some time to come and will not be hampered by fresh legislation.—Lond. *Elec.*, May 10.

British Central Station Account.—An analysis of the annual report of W. C. P. Tapper, of the electric station of Stepney. The total kw capacity of the station is 3720 kilowatts and the maximum supply demanded was 2414 kilowatts. The lamp connections for private lighting represent 108,033 lamps of 8 cp and the motor connections are equivalent to 70,450 lamps of 8 cp (or roughly 2250 hp). The public lighting consists of 406 arc lamps and 109 incandescent lamps, equivalent together to 8650 lamps of 8 cp. Thus the total connections amount to 187,133 lamps of 8 cp (or about 5600 kilowatts). The following figures show the average income in cents per kw-hour sold:

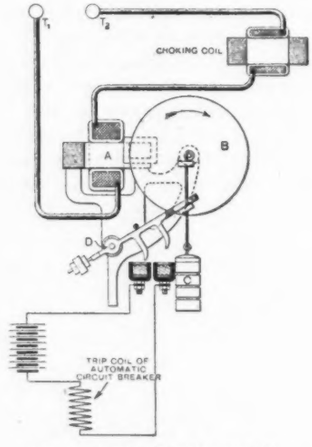


FIG. 4.—LOW VOLTAGE RELAY.

Private lighting	4.60 cents.
Motors	1.94 "
Public lighting	2.58 "
Average for total supply	3.48 "

The total works cost per kw-hour sold was 1.44 cent, the total cost excluding capital charges was 1.96 cents and the total cost including capital charges was 3.44 cents.—Lond. *Elec. Eng'ing*, May 16.

Charing Cross.—An account of the annual report of the Charing Cross, West End & City Electricity Supply Company. The total number of kw-hours generated was 24,500,000 and the total number of kw-hours sold to consumers was 16,664,501. The total expenditure per kw-hour sold to consumers was 4.06 cents and the total revenue 6.66 cents.—Lond. *Elec.*, May 17.

Minimum-Voltage Relay for Alternating Current.—A description of a no-voltage relay for alternating current of English design which combines a time element with an instantaneous no-voltage release mechanism. The release, as shown in Fig. 4, consists of a shaded pole electromagnet *A*, energized by a coil connected across the mains, or to the secondary of a potential transformer. Between the poles of the shaded-pole electromagnet a metal disk *B* is pivoted. It is so arranged that when the coil on the electromagnet is energized by the supply voltage the disk rotates and winds up a suspended weight *C*. The string to which the suspended weight is attached has two stops fastened to it, one above and one below a slot in a pivoted lever *D*, which lever carries contacts which, when the weight is in its bottom position, come against two fixed contacts and complete an electric circuit between them. The completion of this circuit causes current to flow round a trip coil, which is adapted to cause the controlled circuit breaker to open circuit. When the supplied voltage is at its full value, or above a certain minimum, the rotatable disk will keep the suspended weight in its top position, and thus contact is not made between the two fixed contacts. When the supply voltage, however, falls below a certain minimum, the suspended weight is too large to be held up by the reduced voltage; thus, it begins to fall, and when it reaches the bottom of its travel, contact is made between the two fixed contacts and the switch is open-circuited. It will be seen that when the weight is completely wound up, the bottom projection on the supporting string engages on the bottom side of the pivoted lever. When the weight is in the bottom position, the other projection on the string engages on the upper side of the pivoted lever. The time taken by the weight to fall gives the time element, as contact is not made between the fixed contacts until the weight has fallen to, or nearly to, its bottom position. The current required to operate the trip coil is preferably taken from some other source, which remains unaffected when the supply voltage falls. In some cases, however, the current for working the trip coil could be taken from a series transformer included in the same circuit as the controlled apparatus. In this case the trip coil would be normally short-circuited by the pivoted lever, and this short-circuit would be removed when the time element had elapsed after the supplied voltage had fallen below the fixed minimum.—Lond. *Elec. Eng'ing*, May 16.

Wires, Wiring and Conduits.

Current-Carrying Capacity of Conductors.—J. TEICHMULLER AND P. HUMANN.—An article on formulas for determining the current carrying capacity of conductors for house installations. On the supposition that the heat given off from a current-carrying conductor is proportional to the surface, to the difference of temperature of conductor and surroundings and to the time, J. Mueller 50 years ago gave the formula $i = cd^{1.5}$ where i is the current and d the diameter, c being a constant. For thin wires, however, he found that the formula $i = cd$ was valid. It has later been shown that in general the formula $i^2 = c_1d^2 + c_2d^3$, the correct one. For thin wires only the first term on the right hand is to be taken into account, for thick wires only the second term. It will thus be seen that the first two formulas given above are only special cases of this more general formula. The first formula with the power 1.5 has been considered with so much respect for a long time that the Association of German Electrical Engineers based on it, in 1896, their table for the current-carrying capacities of wires for house installations. They found later on that this was not fair for thin wire, and their table was changed so as to permit a higher current for the smaller cross-sections up to 35 square millimeters. The authors have carried out new tests and found that the general formula with the two constants given above is perfectly correct for bare wires in a closed room and also for rubber-insulated wires. The results are given in tables and diagrams.—*Elek. Zeit.*, May 9.

Standardization of Wires and Cables.—The new wiring rules proposed by committees of the German Association of Electrical Engineers for bare conductors and insulated conductors, together with explanatory articles by H. Passavant and J. Teichmüller. The new tables for rubber-insulated copper wires in house wiring are based on the fact that a continuous action of temperatures above 50 degrees C. will cause a deterioration of rubber insulation after 800 or 1000 hours. Since the continuous use of the wires for such a long period hardly does occur in practice, the effect of the heat of the current will be much less and it is therefore safe to specify that 50 degrees C. should be the maximum temperature. The average temperature of a room is assumed at 30 degrees C., therefore an increase of 20 degrees C. is permitted. Extreme cases such as placing conductors in boiler houses or near heating channels are, of course, not included in the tables. The maximum current calculated on this basis is the current at which the fuses will blow. It was assumed that fuses will withstand 1.25 times their rated normal current continuously and only after passing this value will they fuse. The following table gives the figures determined on this basis. Column *A* gives the cross-section in square millimeters, *B* gives the maximum permissible current in amperes, *C* gives the rated capacity of the fuses in amperes:

A.	B.	C.
0.75	9	6
1	11	6
1.5	14	10
2.5	20	15
4	25	20
6	31	25
10	43	35
16	45	60
25	100	80
35	125	100
50	160	125
70	200	160
95	240	190
120	280	225
150	325	260
185	380	300
240	450	360
310	540	430
400	640	500
500	760	600
625	880	700
800	1050	850
1000	1250	1000

Bare copper wires up to 50 sq. mm. in cross-section are also to be determined according to this table. Numerous tables are given for flexibles and for different systems of cables buried in earth.—*Elek. Zeit.*, May 16.

Testing Joints in Submarine Cables.—M. JOHANSEN.—When making final joints in gutta-percha core out at sea, cases may arise where it would be desirable to check the jointer, for instance in gutta-percha core where air bubbles have appeared before or in india-rubber core. For such cases the method illustrated in Fig. 5 is recommended. A metal trough filled

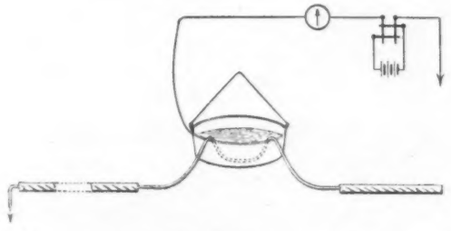


FIG. 5.—TESTING SUBMARINE CABLE JOINTS.

with water is suspended by a piece of gutta-percha core, and a lead to the testing room is clamped on to the metal trough. A battery giving a high pressure is connected to this lead through a sensitive galvanometer, and one pole of the battery is connected to earth as well as one end of the cable. Any steady deflection due to leakage is to be noted. When the joint is ready for cooling and a foot or so of the gutta-percha core on both sides has been bared, carefully cleaned with spirits of wine and dried by the flame of a spirit lamp, the joint is immersed. If this produces an additional deflection on the galvanometer the joint should be rejected. The test incurs no delay in splicing through, as the joint must in any event be immersed for cooling. Another noteworthy feature is that

a fault or low-insulation place in the cable does not render this test impossible or insensitive.—Lond. *Elec.*, May 10.

Underground Mains.—W. Fernie.—A communication in which the writer contends, contrary to the statements made by several speakers in the recent discussion on Rogerson's paper on underground mains, that a three-core cable should be cheaper than three single cables for three-wire distributing networks. He quotes figures in support of this contention.—Lond. *Elec. Eng'ing*, May 16.

Electrophysics and Magnetism.

Analysis of Alternating Current Curves.—H. Vavrecka.—The author first describes a method for quickly determining the different harmonics, up to the ninth one, of alternating-wave curves. This method is specially suitable for the first approximate determination of the amplitudes. In the second part a modification of the method of Houston and Kennelly is described.—*Elek. Zeit.*, May 9.

Electrochemistry and Batteries.

Electric Furnace for Iron and Steel.—J. B. C. Kershaw.—The concluding article of his long summary on yields and costs of various processes. He does not believe that electric reduction of iron ore will be of practical importance in the near future though it may become an established industry in 20 or 50 years. On the other hand, he believes in the use of the electric furnace for steel refining and he even thinks that instead of combining the blast furnace for ore reduction, with the open hearth furnace or the Bessemer converter for making ordinary steel and

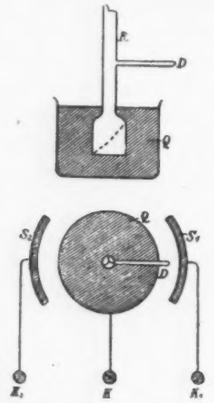


Fig. 6.—Mercury Interrupter Commutator.

with the electric furnace for refining this steel, it will be possible to omit the open hearth furnace or Bessemer converter and refine directly in an electric furnace the pig iron coming from the blast furnace. He thinks that both the arc type of furnace, represented by the Hercult and Keller furnaces, and the induction type will attain a permanent position for special purposes in the steel industry of the future.—Lond. *Elec.*, May 17.

Units, Measurements and Instruments.

Mercury Interrupter as Commutator.—J. Zenneck.—A mercury interrupter of a certain German company consists essentially of a revolving tube R (in the upper diagram of Fig. 6) with a lateral horizontal tube D from which mercury flows out and makes contact with a metallic piece. Since this piece is not entirely circular the current is interrupted whenever the end of D is not opposed to this piece during one revolution of the axle R. To use the same construction for a commutator, two, instead of one, metallic pieces S_1 and S_2 are provided, so that either the circuit KK_1 or the KK_2 in the lower diagram in Fig. 6 is closed according to whether the mercury flowing from the end of tubes D makes contact with S_1 or with S_2. This interrupter may be used for various experimental purposes like determining the capacity of condensers, the polarization of an electrolytic cell, etc.—From *Ann. d. Phys.*, Vol. 20, p. 584; abstracted in *Elek. Zeit.*, May 9.

Measurement of Insulation Resistance and Capacity.—J. Sahulka.—The conclusion of his article on the measurement of insulation resistance and of the capacity of the single conductors of alternating-current net-work during service. The results of the investigation are summed up as follows: The influence of the insulation resistances and of the capacities on the voltages between the conductors and earth is discussed. If one measures the voltage of operation and the voltages of the conductors against earth and repeats these measurements after a resistance has been inserted between one or two conductors and earth, the insulation resistances and capacities of the conductors against earth can be found. For the purpose of a simple test it is only necessary to connect a high-resistance volt-meter between one conductor and earth and to determine which resistance must be connected in parallel with the voltmeter so that the potential difference between conductor and earth decreases by a certain percentage.—*Elek. Zeit.*, May 9.

Induction Coils.—E. W. Ehnert.—The continuation of his paper on the theory and predetermination of induction coils. The author discusses the calculation of the secondary, the condenser, the influence of the size of condenser on spark length, the influence of self-induction of the primary coil on the spark length, and the relation between frequency and capacity of an induction coil. The paper is to be concluded.—*Elek. und Masch.*, May 12.

Testing Bureau.—R. Kopp.—The municipal electricity works in Frankfurt have received official permission to test electricity meters and measuring instruments. In the present article a full description of the testing bureau with photographs and drawings is given. The article is to be concluded.—*Elek. Zeit.*, May 16.

Percentage Bridge.—A. C. Longden.—An article in which the author calls attention to the percentage bridge which has been proposed by H. C. Parker. He emphasizes that this method with a few modifications is in no way inferior to the Carey-Foster method, and that in some ways it is a better method. The author first discusses its various advantages and then shows how one source of error may be eliminated.—*Phys. Rev.*, April.

Measuring Resistance of Battery.—H. Pecheux.—An illustrated note on measuring the resistance of a battery on closed circuit by means of a Wheatstone bridge method, the battery being in one arm and three resistances in the three other arms, with a high-resistance mirror-galvanometer in one cross connection and a switch in the other one. Balance is obtained when the deflection of the galvanometer remains the same whether the last-named switch is open or closed. The procedure in the use of the method is described in detail.—*L'Eclairage Elec.*, May 4.

Telegraphy, Telephony and Signals.

Telephonic Transmission Measurements.—B. S. Cohen and G. M. Shepherd.—A paper read before the (British) Institution of Electrical Engineers. The authors first give oscillograph records of wave forms produced by sounding various letters into a transmitter by which the distortion produced by a cable can be studied. The analysis of some of the waves reproduced brings to light the fact that the attenuation of the current behaved in the special case under investigation in a curiously fluctuating manner as the frequency increased. The percentage of the current received was 81 for the fundamental, 47 for the second harmonic, 57 for the third, 46 for the fourth, 42 for the fifth, 28 for the sixth, 25 for the seventh, 30 for the eighth, 25 for the ninth and for the tenth, 81 for the eleventh, 13 for the twelfth, 3 for the thirteenth, 16 for the fourteenth and 4 for the fifteenth. The big rise at the eleventh harmonic is very noticeable, but the absence of any precise data regarding the terminal conditions of the circuit renders it impossible to explain the phenomena theoretically. Some tests carried out on loaded lines led to an interesting method of ascertaining the highest important frequency in articulate speech. It was found that the highest indispensable frequency lies between 800 and 1100 and also that it is desirable to retain something higher than 1100 periods for really high-grade transmission. Probably 1500 periods per second would be quite a satisfactory figure to base calculations on. Pupin and others used 750 to 800 fre-

quencies for many transmission calculations, and it is important to note that this represents a fair average frequency, as damping constants calculated with this value can be obtained experimentally when using actual speech waves. The authors then discussed the measurements of telephonic current by the barretter and other instruments and the measurement of power in which the accurate measurement of the phase angle is particularly important.—Lond. *Elec.*, May 10 and 17.

Efficiency of Telephones.—H. ABRAHAM.—An account of an investigation which shows that the telephone as an instrument for converting alternating-currents into sound vibrations has an efficiency below 0.1 per cent. The power available for action upon the diaphragm is proportional to the resistance and to the square of the current. Whether the total available power is utilized can be determined when the amplitude of vibration of the diaphragm is known, and when the force required to produce a steady deflection of the same amplitude is measured. The author has carried out these determinations. In a case quoted the resistance of the telephone was 13 ohms, and the telephone current 3 milliamperes. The displacement of the diaphragm was found to be one-third of a micron, or 0.0003 mm. "The elastic force of the diaphragm when displaced to that amount was about 100 degrees." The frequency of the note sounded was 200, in other words, the alternating-current traversing the telephone was one of 200 periods per second. These data suffice for approximately determining the electric power received and the mechanical power developed by the diaphragm. The former was 700 c. g. s. units as a minimum and the latter 1 c. g. s. unit as a maximum. The actual efficiency is certainly less than 1 in 700, probably much less.—Lond. *Elec. Eng'ing*, May 16.

Steno-Telegraphy.—An illustrated description of the "stenocode" which intends a revision of the telegraphic alphabet so as to reduce to a minimum the number of impulses required for each character used in the work of telegraphic transmission. While in the Morse-code tape notation of the Kelvin recorder three elements are used—namely, a right-and-left movement (according to the direction of the current) and the zero or spacing element, there are five elements in the Stenocode notation, namely, a strong right, a strong left, a weak right, a weak left (according to current direction and strength), and a zero element, used for signalling and not always for spacing purposes.—Lond. *Elec.*, May 10.

Wireless Telegraphy.—A. BLONDEL.—For some years alternating-current transformers supplying condensers have been used in wireless telegraphy and it has been found advantageous to employ a certain amount of capacity. This has been explained by the author as a primary resonance effect analogous to the Ferranti effect. Such transformers with secondary condensers in resonance are used in the new station at Nauen, the transformers having open magnetic circuits. For the purposes of laboratory experiments the resonance transformer is also well known. The author thinks that its theory is not yet completely understood. He shows that the regulation of resonance can be obtained in the primary circuit and that the resonance of the secondary circuit can be obtained just as well with transformers with closed magnetic circuit and separate self-induction coils as with transformers with an open magnetic circuit. The author thinks that too much stress is generally laid on the question of resonance, as though the object to be obtained was always an increase of the secondary voltage. He endeavors to show that the feature of this regulation system of wireless telegraphy rests rather in the oscillatory phenomena produced when the period of the complex system is more or less near the period of the current employed for feeding it, absolute tuning being not always desirable. The paper, which is highly mathematical, is to be continued.—*L'Eclairage Elec.*, May 18.

Telephony.—DE LAND.—A continuation of his long serial giving notes on the development of telephone service. In the present installment, he deals with telephone line construction in early days.—*Popular Science Monthly*, June.

BOOK REVIEWS.

ECONOMICS OF RAILROAD CONSTRUCTION. By W. L. Webb. New York: John Wiley & Sons. 339 pages; 34 illustrations. Price, $2.50.

Prof. Webb adds in this volume to his series on railroad work, which is not only of special interest at this juncture when so much public attention is closely concentrated on railroad costs and valuations, but also when the electrical engineer finds many, if not all of these economic considerations forcing their way into his calculations. The first part of the book deals with the financial and legal elements of the construction problem, and embraces many of the topics now under fierce controversy. The second part takes up the operating parts of the problem, and the third deals with the physical elements—distance, curvature, grades, etc. It is to be understood that the whole subject is dealt with from the steam locomotive standpoint, but it is none the less valuable for that, although a good many of the data would have undergone change if electric locomotives were the basis of calculation and argument. We note that the chapter on track economics has nothing to say about rail breakage.

STEAM TURBINES: Practice and Theory. By L. G. French. The Technical Press, Brattleboro, Vt. 418 pages; illustrated. Price, $3.

This is a useful and comprehensive volume based largely upon articles written or handled by Mr. French in recent years when he was editor of *Machinery*. Part of the book is historical and in narrative form, embracing the chief patents; but the major portion is devoted to apparatus that is now in use and to the principles upon which it is constructed. The mathematical treatment deals mainly with the adiabatic flow of steam and the nature of turbine vanes; and a good deal of data is given as to tests upon the flow of steam, the action of steam on vanes and the performance of turbines as compared with reciprocating units. Three or four chapters are well devoted to care and management, condensing apparatus for high vacuum, etc., while an appendix gives curves of the kinetic energy of a steam jet in foot-pounds, and the velocity of a steam jet in feet per second, assuming the steam to be dry initially and that it attains its velocity as the result of adiabatic expansion. The book is profusely illustrated and well indexed, but it would have been a source of great convenience if the engravings had been numbered serially throughout the book instead of being figured separately for each chapter.

New System of Rating Incandescent Lamps.

The Sterling Electrical Manufacturing Company has adopted a new system of rating electric lamps, based upon the principle that the renewal cost per kw-hour of 8-cp, 16-cp and 32-cp lamps should be the same. Under the present system the cost of renewal per kw-hour is greater for the 8-cp lamp than the 16-cp lamp, and less for the 32-cp lamp. The new departure involves a change in rating such that the 8-cp lamp will burn at a less intrinsic brilliancy and therefore with a longer life than the 16-cp lamp; and that the 32-cp lamp will burn with a higher intrinsic brilliancy and, therefore, with a shorter life than the 16-cp lamp.

The new line of Sterling lamps is so constructed than an 8-cp lamp will live just long enough to consume as many kw-hours as the 16-cp lamp, and a 32-cp lamp will consume during its life a quantity less than twice the kw-hours for the 16-cp lamp, this latter disproportion being due to the fact that the cost of the 32-cp lamp is not twice the cost of the 16-cp lamp. The effect of this rating is to decrease the expense and increase the income to central stations for the 8-cp lamp and to decrease the expense to a consumer for the 32-cp lamp. This method gives the central station man an opportunity to say to the small storekeeper and others where it is wished to drive out gas competition that if he puts in this type of lamp it will cost him less

per candle-power than the 16-cp lamp, while it will not increase the cost to the station, as the cost of renewal per kw-hour is not increased.

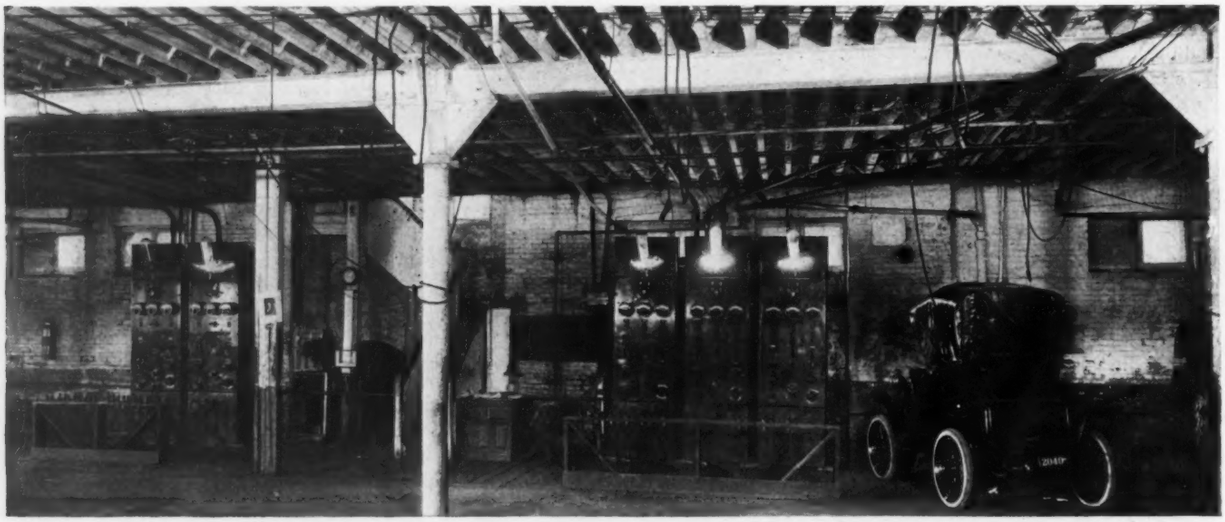
Mercury Arc Rectifier Charging Outfit in Washington Garage.

Among the first to take advantage of the compactness and simplicity of the mercury arc rectifier as a means of charging storage batteries, was the Cook & Stoddard Company, of Washington, D. C. Five mercury arc rectifier outfits, built by the General Electric Company, were installed in their garage about a year ago. Each of these five charging units consists of a 40-ampere mercury arc rectifier tube, mounted on a black enamel slate panel with the necessary switches, instruments and fittings grouped neatly below. Terminals are so arranged that from one to ten vehicles can be charged at one time, each vehicle having a battery equipment of from 12 to 14 cells with a normal maximum charging rate of 20 amperes.

The flexibility of the charging system is still further enhanced by the wiring arrangement in the garage. Cables run from the back of the panels through conduit to the ceiling. The conduits extend to various points in the room carrying several cables each. Each cable terminates in a plug, by which connection can be made to the vehicle battery. This connection-fitting when not in use is rolled up to the ceiling on an ordinary curtain roller. The garage floor is divided into spaces, each having a definite number.

The machines to be charged are run to their respective places, and by means of the flexible terminal, connection is made with a circuit on the rectifier panel bearing, bearing the same number as the space. By this method it is possible to transfer any machine on any panel, suitable cables being provided between panels to enable such interconnections to be made. Five machines are charged in series, two in parallel per rectifier unit. Since the circuits to the machines being charged are interchangeable on the charging panel, it is possible after a period of series charging to rearrange the vehicles, so that batteries of like capacity can be kept together. In this way the most economical arrangement of batteries for charging can easily be made.

Three instruments are mounted on each panel, two voltmeters and one ammeter. One voltmeter having a 300-volt scale indicates the total direct-current voltage across the direct-current terminals, while the other, a 75-volt scale instrument, measures the voltage across each set of batteries as they are charging. This is accomplished by means of a dial switch, the points of the switch being numbered to correspond with the charging plug terminals. The ammeter is so arranged that it will indicate the current in either of the two sets of charging terminals or in both, being provided with a flexible connector for this purpose which taps into suitable plug terminals.



Mercury Arc Rectifiers in Cook & Stoddard Garage, Washington, D. C.

Electric Baggage Trucks.

For carrying baggage and mail between trains, and the baggage and mail rooms of stations, the Pennsylvania Railroad Company has recently built three electrically propelled trucks, two of which are in service in the Broad Street station, Philadelphia, and the third in Altoona.

Although similar in general appearance, the three trucks are not alike. They are regarded as still in the experimental state, and monthly reports of operation are compiled with a view of developing the best type for general use. The following description applies to the particular truck which has been found to be most serviceable up to the present time.

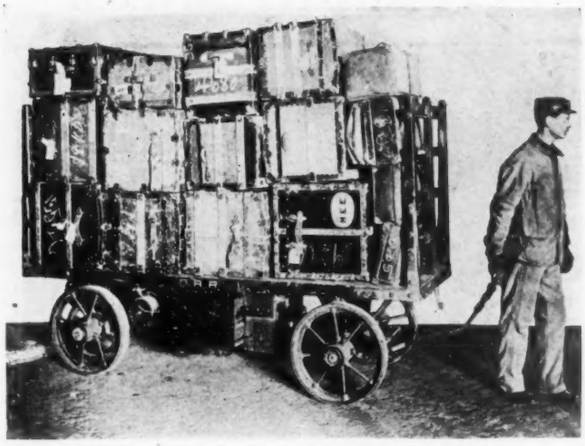
In general appearance, the truck is similar to the hand drawn type universally used throughout the country. It is operated by one man, who walks ahead of it and steers it with a tongue, or handle, in the same way that he would if it were not electrically propelled. Power is taken from a storage battery contained in a box secured to the under side of the platform near the middle. It consists of 14 Willar cells with a capacity of 136 ampere-hours. The batteries are charged about eight hours daily at the rate of 17 amperes.

Each of the rear wheels is driven by a Westinghouse 4-pole, series-wound, 20-volt motor. Double reduction gearing is used between the motor and rear wheel, and each motor is provided with a solenoid brake of the multiple disk type on the end of its shaft. These brakes form an essential element in securing safe operation; for the truck cannot start itself even if on an incline, and if in motion it is stopped promptly and automatically as soon as the power is shut off.

Control of the motor is made as simple as possible. Only two speeds forward and two backward are provided. These are approximately 4 and 6 miles per hour for the loaded truck, and on the crowded platforms these rates have been found fast enough.

The two motors are operated in series and on the low speed a wire resistance is inserted. The motor current is controlled by two single-pole solenoid switches; one for the low and the other for the high speed. These switches are enclosed in a box directly in front of the storage batteries, and current for operating them is controlled by contacts in a small box on the outer end of the tongue or handle.

The contact box is of metal, cylindrical in form, and operated by a rod which slides axially through it. The rod is provided at one end with a ring, which is readily grasped by the operator. A slight movement of the rod starts the truck forward at low speed; further movement of the rod gives high



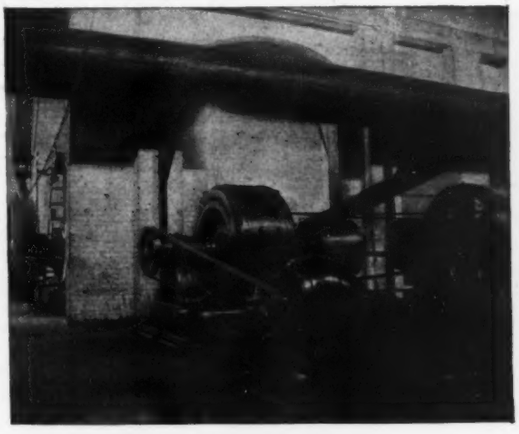
ELECTRIC BAGGAGE TRUCK.

speed. The rod is returned to the off position by a spring so that the instant the ring is released the truck stops. It cannot be started by any accidental knock, but only by an intentional pull on the ring. The pole changing switch for running the truck backward or forward, is located in the box with the solenoid switches and operated by a small lever under the front of the platform. The tongue or handle is connected by reach rods to pivoted bell cranks carrying the two front wheels in a way similar to that generally used upon automobiles.

This truck has been in operation about six months and has won the confidence and approval of the men who use it. One man is enabled to handle immense loads of baggage and mail quickly and without the usual tugging and pulling by several men.

A Non-Stop Run.

Electrical generators have become such a standard product that attention is seldom called to that thoroughness of design and construction which results in such a record of reliability as that shown in the following statement concerning a 150-kw,



NON-STOP RUN.

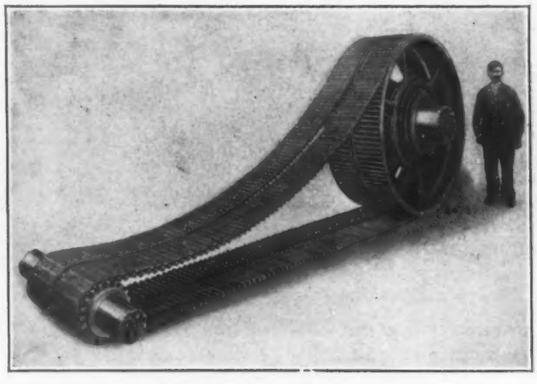
three-phase, belt-driven alternator built by the General Electric Company. This generator ran more than four years, 24 hours a day, with a single stop of 15 minutes due to a defective pulley. The details of this performance are given by Mr. Rhodes, assistant manager of the United States Smelting Company, West Jordan, Utah, as follows:

"The generator was received about June 1, 1902. Put in service October 15, for 11 hours per day until November 9, when 24 hours per day service was required. January 25, 1904, shortly after noon, the paper pulley on exciter went to pieces. A cast iron pulley being on hand, a shut-down of 15 minutes was recorded. From June 13 to 18, 1904, the switchboard was moved, and all feeder circuits were connected directly on the machine without switches or fuses, by means of jumpers without a single mishap to cause a shut-down. Last fall one of the screws worked out of one of the split oil rings on pulley end. Not being able to shut down, we ran along with the remaining one till March 28, 1907, when the machine was shut down for three days; thoroughly cleaned out; new oil put in bearings; collector rings turned true; the broken oil ring fixed and service commenced as usual, Vacouline oil being used during this run. The alternator is belt driven, and an engine located at either side with belt attached in case of emergency. Bearing in mind that this machine carries a continuous overload of 25 to 60 per cent, its record is truly wonderful."

Powerful Renold Silent Chain Drives.

The Seattle Brewing & Malting Company, Seattle, Wash., has installed the largest Renold Silent chain drive in this country — a 325-hp parallel transmission to refrigerating machinery; and under the supervision of Wm. M. Piatt, assistant city engineer, Columbia, S. C., a single strand Renold Silent chain drive has been put in to operate a Worthington centrifugal pump from a horizontal turbine at a speed of 1755 feet per minute. The two chains for the brewing company are run side by side on single wheels 14 feet from center to center, the load being uniformly distributed by Dodge spring-centers on the driven wheel. The speed is 1100 feet a minute. The pump drive measures 11 ft. 7 ins. center to center, and has a capacity of 225 hp.

A Renold silent chain gear, as it is termed by the American manufacturers, the Link-Belt Company, consists of the silent chain and especially cut sprocket wheels. The links, stamped from high-carbon steel, are held together by hardened steel pins and bushings which make a practically indestructible joint and one which provides the greatest possible bearing surface for a given width of chain. It is due to the peculiar formation of the links and their method of contact with the wheels, that the defects and racket common to the ordinary drive-chain are overcome. The stretch that may result from wear of the teeth is compensated for by the chain automatically assuming a larger pitch diameter while providing the surest possible contact with the driving and driven wheel, one half the circumference of each wheel being always in mesh. As this continues to be



325-HP SILENT CHAIN DRIVE.

the case, even when the chain becomes worn, it is evident that its maximum efficiency will be maintained although the demands may be severe enough to completely incapacitate ordinary drives. The chain will run in either direction with uniform quiet and positive action and is not adversely affected by hot or cold temperature, damp or oily situations.

Exhibit Notes
Washington N. E. L. A. Convention

The finest exhibition ever held by associate members at any convention of the National Electric Light Association was opened promptly on Monday night in the large ballroom of the New Willard Hotel amid the din of music and a flood of light. The booths were arranged along the outer walls, and in the center of the room, with two aisles leading from the convention hall to the registration bureau at the other end of the building. Symmetry and taste were everywhere apparent in the arrangement. The booths were uniform in size and decoration, the woodwork being painted white with the name of the exhibitor in gold. Sweeping gently from the center of the arched ceiling to its base were festoons of evergreens, hidden among which, and conforming to the curves, were 2000 4-cp, specially-dipped, orange-colored lamps. These were arranged on the Elblight system. Along the walls, and stretching from column to column, seventy Christmas tree outfits each containing eight lamps, were entwined among the foliage and decorations, while at the F Street end of the hall, on either aisle, was the monogram of the National Electric Light Association, worked in colors and lighted by miniature incahdescent lamps. Over 400 8-cp lamps were distributed along the booths and in the circular windows in the ceiling were the initials of the Association lighted by frosted incandescent lamps. The whole effect was very pleasing; in fact, the floral scheme and arrangement of lamps were the same as used at the Inaugural Ball. In the five chandeliers ordinarily used for lighting the ballroom the 32-cp lamps were removed and 250 2-cp lamps substituted in their stead. Direct and alternating currents of 110 and 220 volts were available in each booth, so that working exhibits could be made if necessary. The electricity was brought from the Potomac Electric Power Company's mains in the basement to the musicians' gallery on the tenth floor by three No. 0 two 500,000 circular mil and one No. 4 0 feeders in the elevator shafts. From the gallery the feeders ran under the platforms on which the booths were erected and taps were taken through watt-hour meters to the various exhibits. Owing to the restricted space and weight limitations of the floor, very few large exhibits were made; the manufacturers of large apparatus contenting themselves with showing photographic illustrations of their products. In the room between the main hall and the registering office were interesting advertising exhibits of business-getting literature by the large electric light companies. Brief descriptions of the exhibits follow:

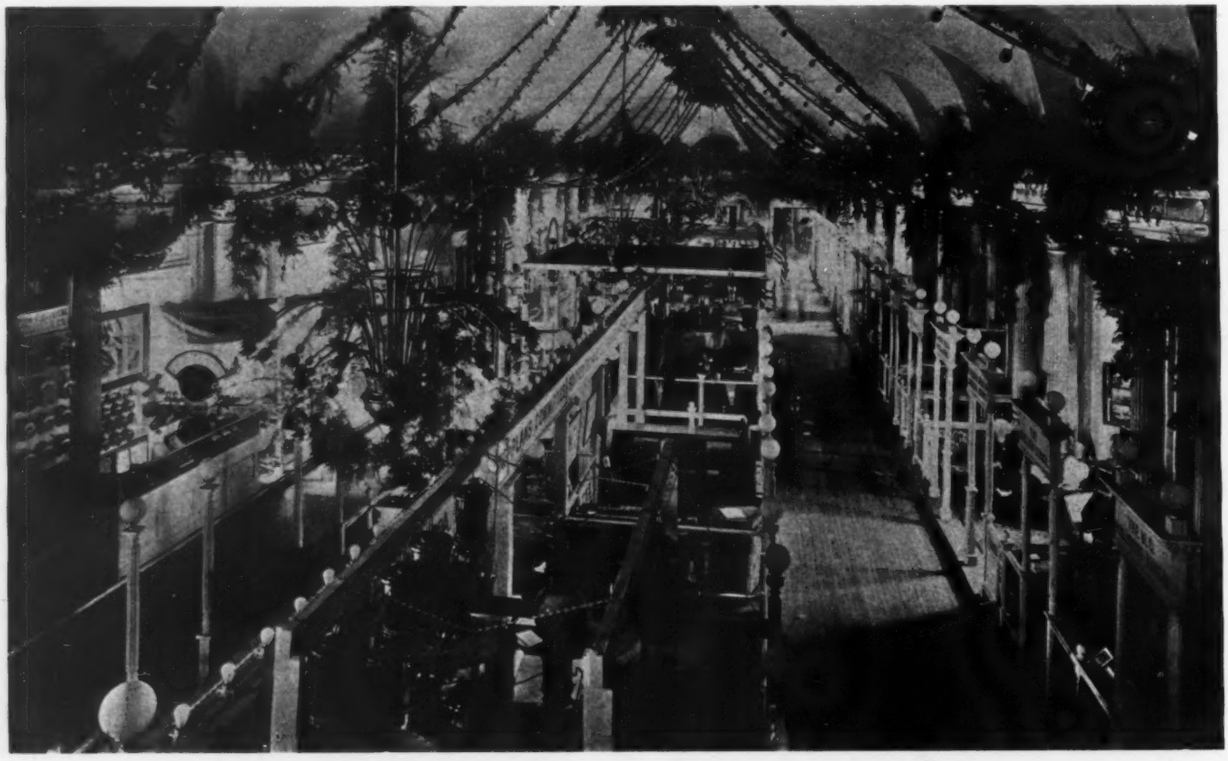


FIG. 1.—GENERAL VIEW OF EXHIBITION HALL AT WASHINGTON CONVENTION, N. E. L. A.

THE OIL WASTE & SAVING MACHINE COMPANY had on exhibition its well-known oil and waste saving machine for extracting grease, oils, etc., from almost any substance, as well as its new turbine centrifugal oil filter. The latter is operated by a steam turbine and the oil is run into the filter through the shaft of the turbine while in operation. The centrifugal force carries the oil through the filtering materials, over the cones to the outlet. The exhibition was in charge of W. W. Barker, the company's New York representative.

RIDGWAY DYNAMO & ENGINE COMPANY was represented by Mr. R. C. Eccleston, of the Ridgway office.

NOVELTY INCANDESCENT LAMP COMPANY was represented by its president, R. K. Mickey, G. A. Nisbet and I. H. Warner.

JANDUS ELECTRIC COMPANY exhibited a 25-light series arc regulator and board with 10 lamps in circuit. The company also displayed its line of 110-volt, alternating and direct-current multiple arc lamps and its line of series lamps. Desk fans and the company's well-known "gyrofan" formed features of the exhibit. The Jandus absolute cut-out and pendant pull switch

for multiple lamps was also shown, as well as the company's constant-current lamp for direct-current service. Representing the company were Mr. Eshleman, of the Cleveland office, and Messrs. L. J. Costa and H. D. Endres, of the Philadelphia office.

KEYSTONE ELECTRICAL INSTRUMENT COMPANY displayed a number of portable and switchboard instruments in the Jandus booth. Mr. J. T. Manypenny was the representative of the company at the convention.

DOSSERT & COMPANY, INC., had on exhibition a full line of its connectors for almost all classes of work. The Dossert joint has been approved by the National Board of Fire Underwriters for use where soldered joints would be required. Mr. E. A. Dossert, H. B. Logan and J. J. Dossert were in attendance.

THE AMERICAN ELECTRIC HEATER COMPANY had on exhibition a complete line of heating and cooking apparatus.

COMMERCIAL TRUCK COMPANY OF AMERICA had one of its auto buses in use during the exposition, carrying passengers from the hotel to the Capitol. This vehicle has a 4-motor, four-wheel drive, the advantages of which are that the power is distributed equally on all wheels so that less electric energy is required in starting. This necessarily means a reduction in the cost of battery maintenance and tire expense, and practically does away with slipping or skidding. Mr. L. A. Tirrell, the chief engineer of the company, was in attendance.

CROCKER-WHEELER COMPANY were represented by W. C. Appleton, Rodman Gilder, G. W. Johnson and H. Loomis. The company's exhibit was made up of a number of photographs showing the various applications of its products.

CROUSE-HINDS COMPANY displayed a complete line of its well-known "condulets." Bulletins were distributed in which various applications of the company's product were illustrated and described. The imperial arc headlight, together with panel boards and cabinets, completed the exhibit.

EXCELLO ARC LAMP COMPANY was represented by its manager, O. Baerwinkel.

NATIONAL METAL MOULDING COMPANY sent its vice-president, C. E. Corrigan, and its assistant manager, C. F. Boynton, to the convention.

HUGO REISINGER, the well-known dealer in imported carbons, was represented by C. A. DuBosch.

STANDARD UNDERGROUND CABLE COMPANY had a number of its representatives present during the convention week. Among these were C. W. Davis, C. A. Brown and F. C. Cosby.

NATIONAL CARBON COMPANY was represented by D. D. Dickey, N. C. Cotabish and J. S. Criger.

GENERAL ELECTRIC COMPANY occupied a prominent space in the exhibition hall. This was used chiefly for the reception of visitors, although a number of the company's fan motors were on exhibition, and the booth was attractively decorated and brilliantly illuminated with the company's high efficiency tungsten, tantalum and "Gem" incandescent lamps. Many of these were displayed in combination with forms of Holophane reflectors. Among the many representatives of the company present were: J. R. Lovejoy, vice-president and sales manager; C. D. Haskins, manager lighting department; E. E. Gilbert, manager turbine sales department; W. L. R. Emmet, engineer of the lighting department; P. D. Wagoner, manager transformer sales department; A. D. Page, F. W. Wilcox, C. B. Burleigh, A. D. Bobson, T. Bevan, A. F. Giles, G. L. Thompson, H. P. Buddy, W. J. Honley, J. Scribner, W. H. Coleman, S. F. Dibble, H. W. Hillman, F. H. Gale and F. G. Vaughn.

THE WESTINGHOUSE COMPANIES exhibit occupied four booths. The companies represented were the following: The Westinghouse Machine Company, Westinghouse Electric & Manufacturing Company, Westinghouse Lamp Company and Nernst Lamp Company. The arrangement of exhibits was very tasteful, considering the limited space available for the display of the extensive lines marketed by these different companies for the field covered by central station work. Many lines of new apparatus were shown. The exhibition of the direct-current series arc lamps was shown to the public for the first time. These were shown in operation on the Fourteenth Street side of the New Willard Hotel, 8 of the lamps burning in series, each taking 50 volts and 4 amperes. The current for this purpose is taken from the alternating-current street mains at 220 volts, 60 cycles. A regulating transformer steps up the voltage and regulates the current supplied, and a mercury rectifier changes the current from alternating to direct. This metallic flame arc lamp requires one-half the electrical energy consumed by the ordinary carbon lamp, and is particularly adapted to street lighting, since the rays of light are emitted from the flame in a horizontal direction, and the color values are the best possible for this purpose.

The Westinghouse Lamp Company had burning a large number of its high-efficiency, metalized-filament lamps ranging in candle-power from 20 to 50, all burning at a voltage of 110. Later in the week some tungsten lamps were burned in a cluster suspended from the ceiling.

The Westinghouse Electric & Manufacturing Company had displayed on a table a very complete line of instruments, both for switchboard and portable use. A sample of each of its graphic recording ammeters, voltmeters and wattmeters were shown. The new carbon-break, circuit-breaker, was also shown, as well as the popular small capacity circuit-breaker for motor service. Fan motors in both 12-in. and 16-in. sizes for alternating and direct-connected currents were in evidence all over the building. There was also shown many types of enclosed carbon arc lamps, including the series, multiple alternating-current and direct-current, 110 and 220-volt lamps in a variety of finishes, and in addition a new lamp which has been developed for 250 volts, direct-current, multiple series, which is strictly fireproof, and will not burn out under the most severe conditions of short circuits.

The Nernst Lamp Company showed the development of a new single-glower unit to provide a lamp to fill the gap that has heretofore existed between the one and two-glower units, the one-glower unit not giving sufficient light for certain classes of lighting, and the two-glower unit giving more light than necessary. This lamp takes 110 watts, emitting 115 cp in a downward direction, and is equipped with a 4-in. clear ball.

In the Nernst Lamp Company's section of the booth was shown two three-glower ceiling fixtures of art glass; and also one three-glower ceiling fixture with 9-in. Holophane hemisphere; also one three-glower ceiling fixture equipped with an opalescent hemisphere, and one six-glower ceiling fixture equipped with a 12-in. Holophone hemisphere. On a table were shown several three-glower direct-connected lamps; also four single-glower Nernst lamps equipped with vertical glower.

The Westinghouse Machine Company had on exhibition various sized battery plates showing the form and construction of those used on the improved storage batteries. These plates are of the Planté type, both the positive and negative being of pure lead. The plates of the types shown were used in street railway power plants for load regulation, lighting plants, railway train lighting, railway signaling, etc., etc.

The Westinghouse Companies maintained headquarters on the ground floor of the New Willard Hotel, in the Pink Room, where representatives of the companies congregated daily and received their friends. The following is a list of the representatives present:

Westinghouse Electric & Manufacturing Company.—W. M. McFarland, acting vice-president; G. M. Bates, J. W. Busch, Philip Clegg, A. M. Dudley, C. S. Gibbs, C. B. Humphrey, A. R. Laxton, S. L. Nicholson, E. T. Penrose, J. W. Schrantz, C. P. Billings, J. A. Brett, H. P. Davis, W. R. Dunbar, G. B. Griffin, R. B. Ingraham, Geo. F. Leak, J. C. McQuiston, J. M. Nicholson, W. R. Pinckard, H. C. Stier, J. C. Warren, E. M. Bischoff, Samuel Chase, Mr. De Lancey, W. B. Everest, G. W. Hill, W. D. Jend, Irwin Lehman, F. D. Newberry, W. S. Rugg and H. Van Stagen.

The Westinghouse Machine Company.—Edwin Yawger, L. A. Phillips, L. L. Brinsmade, Mr. Nicholson, H. Van Blarcom and J. R. Bibbins.

Westinghouse Lamp Company.—T. Whaling.

Nernst Lamp Company.—Max Harris, J. H. Gardiner, C. A. Barton, A. T. Holbrook and Otto Foell.

Electrical World had a booth on the end of the aisle facing the registration bureau. A line of standard books for central station managers were on exhibition and copies of the June 1 number were distributed. The editorial staff was represented by Messrs. Martin, Cravath, McAllister and Onken, and the business department by Messrs. Wakeman, Elliott, Beard, Walker, Church and Doyle.

Wagner Electric Manufacturing Company was represented by W. A. Layman, general manager of the St. Louis office; Walter Robins, the assistant general manager; E. W. Goldschmidt, of the New York office; Brooks Faxson, of the Boston office; John Mustard, of the Philadelphia branch; A. W. Jewett, of the Chicago branch; E. W. Henry, of the Atlanta office, and A. W. Wyckoff, of the Pittsburg office. On exhibition were a number of the company's well known single-phase induction motors, both of the standard and variable speed types, together with indicating switchboard and portable instruments.

M. O. Publishing Bureau had an exhibit in charge of A. H. Grant and G. Marston. Illustrations of "Alice in Municipalland" were displayed as well as a complete library of works on municipal ownership.

Western Electric Company made a telling display of alternating-current and direct-current fan motors and also two direct-current and two alternating-current arc lamps. The "Hawthorne" arc lamp which is very compact, being only 20 inches high, formed a feature of the display. Some of the company's literature was distributed and a map of the city of Washington together with a small celluloid "Hawthorne" arc lamp were distributed as souvenirs. Mr. Rockafellow was in charge of the exhibit, assisted by Mr. Post, the advertising manager of the company; Mr. Howlett, sales manager of power apparatus, Chicago office, and Mr. Templin, supply salesman of the Chicago office. Many other representatives of the company dropped in during the week.

Oneida Community, Ltd.—This exhibit was of special interest to central station men, the galvanized chain made by the community now being extensively employed for raising and lowering arc lamps and also for hanging electric signs. Being very heavily galvanized, the chain withstands the severest weather conditions besides giving an air of security and permanency to work. Short lengths of chain were given away and the 60 different styles and sizes of chain were prominently displayed. The exhibit was in charge of V. W. Lee and J. N. Milnes, Jr.

H. P. Brown demonstrated contact alloys ground clamps and a new joint developed during the year. Mr. Ely, Mr. Kroner and Mr. Coote represented Mr. Brown during the convention.

The W. J. Barr Electric Manufacturing Company made a very complete display of its electric heating and cooking devices. All the appliances are equipped with "Eureka" units and all operate in the same way. Back of the booth was an electric sign with the name "Barr-Iron." The exhibit was in charge of W. J. Barr and A. F. Brown, the New York representative of the company.

Southern Exchange Company was represented by the president of the company, Mr. E. G. Chamberlain, and W. E. Mitchell, the sales manager. Samples of Southern cedar and cross-arms of long-leaf Georgia pine were on exhibition as well as photographs of the company's mills and pole yards in the South. The company makes a specialty of Southern white cedar p es and yellow pine octagonal poles. Mr. Chamberlain, who is a prominent figure at many conventions of late, reports that his company is doing the largest business in its existence.

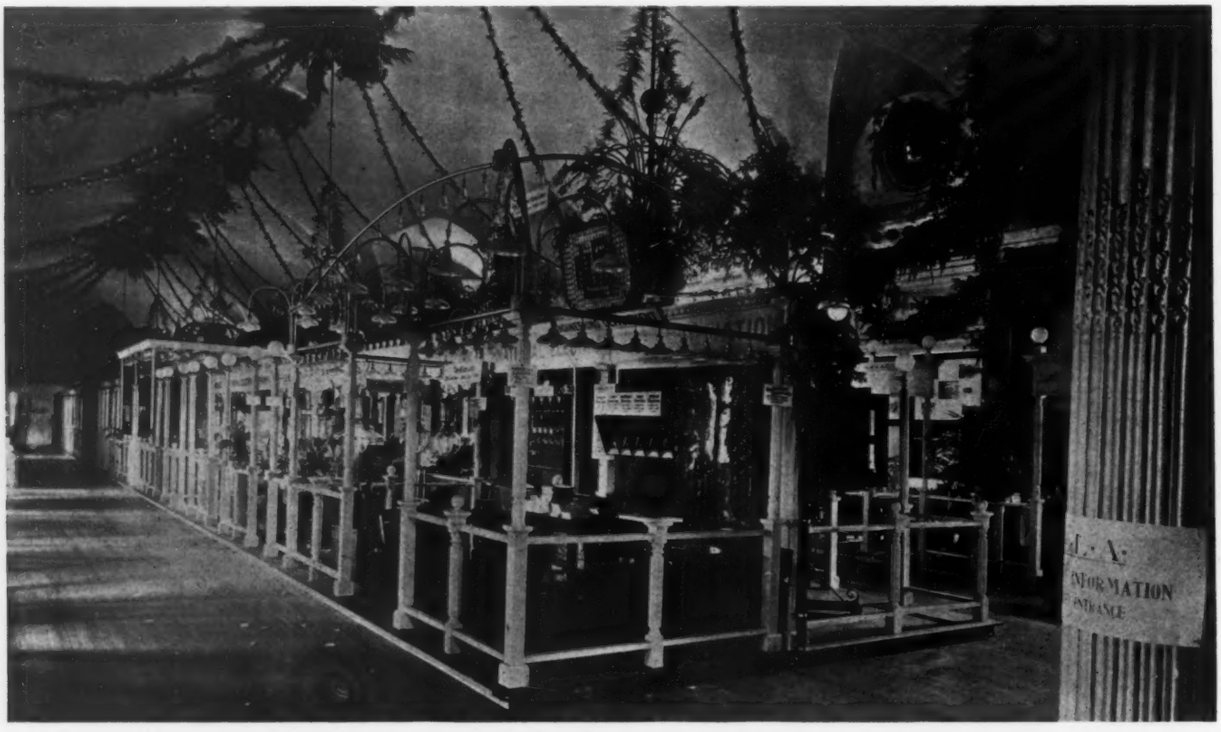


Fig. 2.—Exhibits at Washington Convention, N. E. L. A.

G. M. Gest who is sometimes called the electric undertaker in that he buries wires, had on exhibition a number of photographs showing pictures of work in Mexico, Toronto and other points in the United States. In the center of the booth was a very large photograph showing the underground work built by Mr. Gest for the American Telephone & Telegraph Company between New York and Boston. The patented cable rack made by Mr. Gest was also shown. Mr. W. T. Jackson, of the Cincinnati office had charge of the booth and Mr. Gest was a visitor on Thursday.

National Electric Supply Company made an exhibit of chestnut poles, pins, brackets, cross-arms, etc. The Helios flaming arc lamp which may be used interchangeably on direct and alternating-current circuits was a feature of the display. The company also were contractors for all the electrical work done in connection with the convention. E. C. Graham, T. L.

Townsent and A. M. Dunlop were the company's representatives.

THE PHILADELPHIA ELECTRICAL AND MANUFACTURING COMPANY had a very interesting exhibit close to the Convention Hall. In the center of the booth was a section of a model manhole fitted with conduit, cables, transformers, etc., with leads for house connections. To one side was the company's incandescent street lighting fixtures, cut-outs, fuse boxes, joint wrappers and plugs for conduit, etc. The exhibit was in charge of C. L. Bundy who was assisted by Mr. Manwaring.

AMERICAN INSTRUMENT COMPANY made a very neat display of its direct-current instruments. On exhibition were all types of switchboard and portable instruments. The ammeters are arranged to operate in connection with interchangeable shunts which are adjusted to give a uniform drop of exactly 50 milli-volts on full load. Each milli-voltmeter, together with its leads is adjusted to have a resistance of one ohm and to give the full scale deflection on 50 milli-volts. Thus any shunt of any capacity can be used with any instrument. Every detail of the design has been carefully thought out so that superior construction has resulted. The company was represented by Thompson, of the Boston office. Literature pointing out the good qualities of Fibre Conduit was distributed.

THE FORT WAYNE ELECTRIC WORKS made a display of transformers, meters, arc lamps, fan motors, etc., in a tastefully arranged booth on the east side of the hall. The "Wood" system of series arc lighting was shown with lamps of various finishes. The exhibition was in charge of F. S. Hunting, sales manager, assisted by A. A. Serva, assistant sales manager. Other representatives of the company included Messrs. Lott and Moulton, of the New York office; Messrs. Sturgeon, Woolsey, Thomas, Porter, Brown and Morton, of the Philadelphia office, and Messrs. Smith and Ochs, of the Boston office.

SHELTON ELECTRIC COMPANY had an exhibit of vibratory massage machines in the Fort Wayne space. Mr. G. Shelton came on from Chicago to interest central station men in the device which furthers the use of electricity and can be pushed with other electrical apparatus by the new business departments of central station companies.

NATIONAL ELECTRIC LAMP ASSOCIATION.—The engineering department made a large and extensive exhibit in a double booth adjacent to the convention hall. The booth was easily distinguishable from all others, because of the brilliant display of lamps of all candle-powers and efficiencies. On top of the white pillars and in keeping with the surrounding decorations was an arched framework on which were displayed the various types of high-efficiency lamps sold by members of the National Association. On the two center arches were 86 tungsten street series lamps. The lamps are of the 40-cp, 5½-amp. type and operate nine in series on 110-volt circuits. On top of the two posts at either side of the entrance were 40-cp tantalum lamps with a consumption of 2 watts per candle. On either side of these lamps were 20-cp tantalum lamps with Holophane reflectors. The corner posts directly opposite the entrance to the convention hall were fitted with 80-cp 100-watt tungsten lamps. The electroliers on the remaining corner posts carried Gem lamps in Holophane reflectors. At one end of the booth was a row of 50-watt, 20-cp Gem metallized filament lamps, while on the end directly opposite was a row of 27-volt tungsten lamps. Facing the entrance of the booth was a compartment box displaying the light qualities of the various lamps. Ribbons of different colors and shades were arranged under the different lamps, giving a striking effect easily appreciated by a layman. At the right of the entrance was a case containing a number of tantalum and tungsten lamps of miniature size. These lamps operate at various voltages from 2 to 27 volts; but since the size of the filament in each lamp is the same, the lamps may be operated in series. On a table close by were a number of 1.3-volt tantalum lamps lighted from small dry batteries. To the

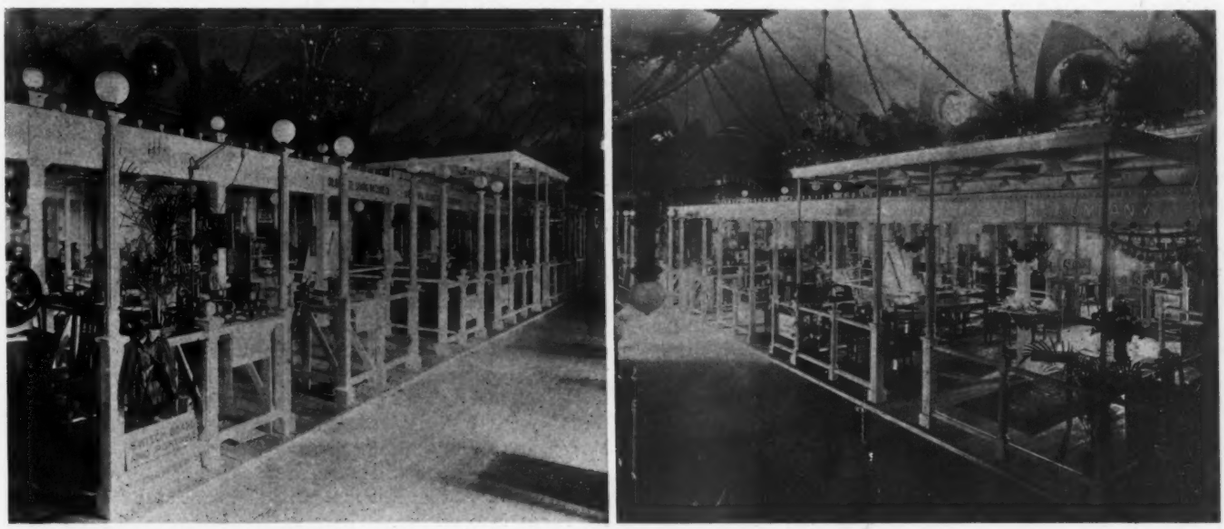


FIG. 3.—TWO AISLES IN THE EXHIBITION HALL.

J. G. Biddle, general sales agent; T. G. Seixas, the New York manager, and B. S. De Cou.

ELECTRIC STORAGE BATTERY COMPANY was well represented by the following gentlemen: E. L. Reynolds, manager of the Pennsylvania sales office; Charles Blizard, third vice-president; Albert Taylor, manager of the New York office, and A. H. Ackermann, engineer of the New York office. The increasing use of electric vehicles among central stations caused the company to exhibit a complete outfit of its well known "Exide" battery. The company also showed recent developments in its automobile cell filling apparatus, its compensating, recording and signaling hydrometers and its various types of the "Chloride Accumulator" for central station service. One hundred and fifty-eight central stations have now been equipped with batteries by the Electric Storage Battery Company and the New York Edison Company which now has 37 batteries in service has ordered during the convention five additional batteries. A recent development of the Electric Storage Battery Company is an end-cell switch of great interest. This switch has now been so improved that the time of travel of the brush over 20 points has been reduced to 15 seconds. Photographs of battery installations and detail parts of "Exide" and "Chloride" cells were also on exhibition.

THE FIBRE CONDUIT COMPANY occupied a booth near the center of the Exhibition Hall where a line of underground conduit was shown. Messrs. W. K. Sparrow and F. A. Curtis, of the Orangeburg office were present as well as Mr. S. G.

left of the entrance was a test board arranged to show the actual consumption of the various lamps, the effect of voltage variations and other technical points of interest to all users of incandescent electric lamps. A feature of the display was an electric sign on the back wall and directly above the center of the booth. In this nearly 400 red and frosted globe lamps were used to make up the monogram of the Association, N. E. L. A. The engineering department distributed a number of bulletins on lamps and illumination. Bulletins No. 1 and 2 give a brief description of the N. E. L. A. and the Engineering Department. Bulletins Nos. 3 and 4 treat of the Gem metallized filament lamps. Bulletin No. 5 describes the tantalum lamp, while Bulletins Nos. 6 and 6-A give a brief description of the new tungsten lamps. Bulletin No. 7 contains data on illumination for the use of architects, illuminating engineers, etc. The bulletin contains many tables of value in wiring for and placing incandescent lamps. Among the National men in attendance were H. B. Vanzwoll, secretary of the Association; S. E. Doane, chief engineer; J. B. Crouse, H. A. Tremaine, H. M. Vanzwoll, Mr. Irving, of the Sunbeam Incandescent Lamp Company of Canada, Ltd., and Mr. Kulas of the Brilliant Electric Company. The booth was in charge of W. M. Skiff and G. Merrill of the engineering department.

Mr. John L. Gleason had on exhibition a complete line of his "Fancleve" electrical specialties, including offset boxes for rigid conduit, switch and junction boxes for exposed conduit, outlet boxes for flexible fibrous conduit, switch, receptacle or junction boxes for non-metallic conduit, universal switch mounts for snap switches, receptacles or wall sockets, blank and universal moulding taps, reduction boxes, moulding boxes, etc. Accompanying Mr. Gleason was T. F. Welch.

Pope Motor Car Company.—The Waverley, or electric, department of this company was represented by Mr. H. H. Rice, Mr. W. C. Downing and H. Goodman. These men devoted their entire time interesting central station men in the electric automobile as an adjunct to central station load. A small mercury-arc rectifier was shown in operation charging a battery kept in action. The whole purpose of the exhibit was to demonstrate to central station men that electric vehicle charging was profitable with energy at a reasonable rate furnished off the peak, and that with proper cooperation on the part of central stations the use of electric vehicles would increase immensely to the profit of the central station and the automobile manufacturer.

Standard Paint Company showed its well-known P. & B. products, including electric compounds, insulating varnishes, taps, etc. Ruberoid roofing also formed a feature of the exhibit. Those in attendance were J. N. Richards, general sales manager; W. E. Smith, manager of the paint and electrical department, and J. G. Satterthwait, manager of the Philadelphia office.

Allis-Chalmers Company had a double booth facing the convention hall. The company made no exhibit other than a complete collection of photographs of products and installations and also framed pages of the company's publications. A sign was displayed calling attention to the exhibit of the Allis-Chalmers Company at the Jamestown Exposition, whither many electric light men were bound. W. S. Heger, assistant to the president, was in charge of the booth. Other representatives of the company were Messrs. Peck and Rowley, of the New York office; Mr. Pardee, of the Boston office; Messrs. Jeffrey, Williamson, Frankenfeld and Behrend, of Cincinnati; E. St. J. Chilton and A. A. Whiteside, of Milwaukee; Jas. Gardner, of the Chicago branch; Mr. Lucas, of Baltimore, and Mr. Nicholson, of Philadelphia, together with Mr. W. Thomas, of the Atlanta branch. Souvenir badges showing an Allis-Chalmers turbo-generator set on one side and the name of the company on the other were distributed.

The Dearborn Drug & Chemical Works made no exhibit, but had its booth handsomely equipped with wicker furniture and rugs, together with other conveniences for the reception of visitors. Arranged on a table were samples of boiler scale, corroded and pitted tubes and valves, illustrating the conditions which the Dearborn compounds are intended to correct. Representing the works were W. B. McVicker, second vice-president and Eastern manager; G. F. Duemler, of Philadelphia, and H. G. McConnaughy.

Simplex Electric Heating Company occupied a large booth where an extensive display of electric heating and cooking apparatus of all kinds was made. Prominent among the apparatus was a large electric range and also a smaller range of similar type. There were also displayed electric flat irons from 3 to 18 pounds in weight, plate warmers, radiators, shoe irons, sauce pans, water cups, heating pads, curling iron heaters, portable stoves, urns, waffle irons, sterilizers, soldering irons, griddles, broilers, etc. On a board were shown the various parts of a small stove and of a flat iron, the larger apparatus being similar in construction. All kinds of plug switches were also shown, prominent among which was a 15-ampere flash plug switch, the first of its kind on the market. The company is installing 250 of these in the City College in New York City. Those in attendance were J. I. Ayer, manager of the company; Roger Williams, Mr. Howard and C. A. Flint.

Metropolitan Engineering Company had one of the end booths in the center aisle facing the registration office. A feature of the company's exhibit was its No. 1400 double-face, electric panel sign suitable for any kind of business. The company's No. 808 interchangeable sign, which is sold in large quantities to central stations, was also a feature. The company has brought out 18 new styles since last year, and has just closed contracts for 50 signs for the United Cigar Stores Company. Each of these signs is made of porcelain enamel with the trade-mark of the United Company also made up of similar material. Each sign is fitted with 178 lamps. Movable face signs and photographs of signs also formed part of the exhibit, which was in charge of Benjamin Wall.

Pittsburg Transformer Company made an artistic display of its products. Transformers of 1-kw, 10-kw, 15-kw and 100-kw capacity were shown. The latter two were for high-tension work. A small high-tension potential transformer for switchboard work was also shown. The company distributed souvenir "stogies," otherwise known as "Pittsburg Smoke," and also a special edition of the "pretty girl" calendar. Souvenir postal cards were also distributed. F. C. Sutter, H. G. Steele and R. V. Bingay represented the company.

The New York Beck Lamp Company had a number of direct-current and alternating-current American Beck flaming arc lamps in operation. The lamp has been considerably improved in design and has been made much simpler by the elimination of clock mechanism. Representing the company at the convention were W. Ottmann, J. H. Hallberg, H. B. Coles and C. A. Loeffler.

Standard Vitrified Conduit Company occupied the first booth along the wall adjoining the convention hall. Samples of the various sizes of conduit made by the company were on exhibition and placards with catchy sayings were in evidence. B. S. Barnard, vice-president and secretary of the company, was in charge of the exhibit. Mr. R. W. Lyle, who is president and general manager of the company as well as president of the Great Eastern Clay Company, was a visitor during the week. Mr. Lyle has devoted his life to mastering the practical details of the clay working industry and has a host of friends who were glad to see him at the convention.

Franklin Electric Manufacturing Company was represented by G. O. Curtis, C. Leonard, C. N. Thorpe, F. G. Truitt and P. S. Klees. A feature of the exhibit made by the company was a large reproduction of the label on the new "Novi" lamp. This was studded with 704 one-half candle-power lamps. A number of standard "Femco" and Franklin Gem lamps were also shown.

Federal Electric Company.—The sign exhibit of this company occupied a prominent space along the wall near the center of the hall. Sectional and interchangeable panel signs, Meridian clusters and a line of samples of sockets and bushings were featured. A large blue enamelled sign with the lamps fed through a flasher made a catching exhibit. W. A. Norton, general manager of the New York office, was in charge, assisted by R. B. Francis, of the Chicago office.

Industrial and Commercial News

Commercial Intelligence.

THE WEEK IN TRADE.—Throughout the northern half of the country the unseasonable weather continued, with the usual effect of limiting retail trade, except in a few sections. The meaning of the backwardness of Spring is realized in the statement that at the close of May, this year, retailers had on hand a stock of undisposed goods larger than any at the same time in the past 25 years. The crop situation has been helped by good progress in spring wheat and some gains in parts of the winter wheat belt which has had necessary moisture. Corn planting has been finished, but the cotton crop appears to have either stood still or gone backward as a result of cold nights, heavy rains and poor stands. There is still general complaint that reorder business from jobbers and manufacturers, especially in all kinds of wearing apparel, has been smaller than expected, and there was manifest a greater disposition to await developments before embarking heavily for the future, though the volume of business booked ahead compares well with preceding years. Manufacturing plants are producing at full capacity in mose industries, orders covering output far into the future, and more New England cotton mill employees have received advanced wages making the change affect about 85,000 hands. Money was easy, but collections were slow or backward at best. Strikes were more in evidence as shown in the continued interruption to business at San Francisco, the lingering of the longshoremen's strike in New York, and smaller strikes of southern carshop and street-railway employees. There is also some prospect of unsettlement in the reports of demands for higher wage scales by iron workers and coal miners in the Central West. Pig-iron markets were quiet, but very strong in price. Supplies for early delivery are very scarce, hence foreign iron continues to be purchased in moderate volume. Considerable new business in steel rails was booked, most of it for delivery in 1908. May was a good month for structural steel interests, the tonnage engaged being very heavy, and large orders are looked for within the next few months. Agricultural implement makers have ordered steel bars and shapes very freely. Copper was easier than it was in the previous week, while offerings of electrolytic were larger, but business was quiet. It is said that some consumers who purchased copper months ago are offering it for sale. Lake closed at 24⅛ cents; electrolytic, 23⅜ cents, and casting copper at 22½ cents. According to *Bradstreet's* there were 142 business failures during the week ending May 30, against 165 in the week previous and 127 in the corresponding week last year.

MATERIAL FOR AUSTRALIA.—The Postmaster-General's Department, Adelaide, Australia, will on July 10 open bids for 5 miles insulated copper wire, 500 copper tapes, 5000 copper binders, 2 switchboards, 2 lightning arrester boards, 1000 fuses for telephone sets, 500 Leclanché cells, No. 2 size, 100 mechanical registers, 12 differential galvanometers, 15 electro-magnetic transmitters, 6 registering boxes, plug pattern. (2) The Municipality of Albany in Western Australia invite bids for the supply of public or private lighting, any system, for 15 years from May 1, 1908. Address the Town Clerk. The Deputy Postmaster-General, Brisbane, Australia, invites bids until September 2 for four sections of a common battery switchboard and 650 subscribers' telephones to specification No. 145, particulars being obtainable from the Comptroller of Stores at Brisbane, Melbourne, Sydney, and Adelaide. A deposit must be made, in making tender, with the Deputy Postmaster-General at Sydney, Melbourne, or Adelaide, of 5 per cent of the amount of bid up to $5,000, and 2½ per cent of any additional amount exceeding $5,000.

TELEPHONE CONTRACTS.—The general contract agent of the American Telephone & Telegraph Company has notified customers of the company that upon the termination of their long distance telephone toll contracts any special discounts allowed them will be discontinued. When it is possible by the terms, the contract will be canceled within 30 days. The reason given is that the cost of labor, material and operation have increased to such an extent that it is not considered advisable to continue the discounts which have heretofore been allowed, amounting in some cases to 25 per cent of the charges. The percentage of the total subscribers of the company thus affected will be considerably less than one per cent. Hence there will not be any appreciable effect on the company's earnings. The company agreed to allow these discounts to large customers on the long distance toll service as a means of exploitation. Having served the purpose the company finds it advisable to discontinue the discounts and put the toll business on an equal basis for all. The leased wire service will not be affected in any way.

THE SIERRA POWER COMPANY, consisting of H. H. Clark, of Bullfrog, Nev., and Luther G. Brown, of Los Angeles, has applied to the San Francisco Board of Supervisors for a franchise to lay cables and underground conduits for the supplying of electric light and power. The Sierra Power Company claims to have rights on the King's River in California which will enable it to develop a total of 400,000 horse-power. J. C. Browne, the general superintendent of the company, states that it is the intention of the company to supply the towns of Western Nevada, Los Angeles and San Francisco within 18 months. A. B. Spencer has charge of the contract department.

THE KERN RIVER PLANT.—The Edison Electric Company of Los Angeles has successfully started up its large hydro-electric power plant on Kern River and is now regularly supplying power over its 117-mile transmission to Los Angeles and to its distribution network in that vicinity. Water was first turned on the wheels on May 13 and on the 19th the power was delivered for the first time in Los Angeles. This plant is one of the largest in the country, having a normal capacity of 20,000 kilowatts. It is unique for its 8 miles of tunnels, its gravity conduit, its pressure main tunnel, its water-wheel equipment, and its steel tower transmission line, designed for 75,000 volts. The plant in its entirety cost about $3,500,000.

ENOREE POWER PLANT.—A charter has been granted to the Enoree Power Company which will develop the water power on the Enoree River, with offices and headquarters at Wellford, S. C. The president and general manager is Mr. A. B. Groce, the president and treasurer of the Tyger Shoals Milling Company, of Wellford. The capital of the power company is $100,000. The company will promote and execute the development referred to and will transmit electrical energy to the Fountain Inn Manufacturing Company, S. C., for the operation of its cotton mills, and for lighting and other purposes. The capacity will be about 1000 horse-power.

H. M. BYLLESBY & COMPANY, Chicago, have been retained as consulting engineers for the Sioux Falls Light & Power Company, of Sioux Falls, S. D. A water power with a head of about 80 feet is to be constructed on the Big Sioux River at this point. The same firm has been retained as consulting and operating engineers for the Flathead Valley Water Power Company, of Kalispell, Mont. The company's water power is situated at Big Fork, Mont., on the Big Fork River, having a head of about 105 feet. This development is to be added to and the capacity of the plant greatly increased.

RIDGWAY DYNAMO.—One result of the recent annual meeting of the directors and stockholders of the Ridgway Dynamo & Engine Company, of Ridgway, Pa., was the reorganization of the sales department. Mr. H. A. Otterson, formerly assistant superintendent, has been made sales manager, with Mr. R. C. Eccleston as his assistant. In addition to the usual work, the control of all agencies and the advertising has been placed in this department.

THE COBALT DEVELOPMENT.—The great mining development in the Cobalt region of Canada is leading to an inquiry for electrical apparatus of all kinds. Directors of the Nipissing Central Railroad now propose constructing an electric railroad from Cobalt to New Liskeard immediately. The charter of the company allows them to build and operate a road from Lake Temagami to Lake Abitibi.

ELECTRIC RAILWAY TERMINAL.—The New York, New Haven & Hartford Railroad has bought from William Waldorf Astor a tract of ten acres on the north side of West Farms Road, extending from Morris Park Avenue to Van Nest Street, the Bronx. Part of the tract will be used in connecting the tracks of the New York, Westchester & Boston Railway and the Harlem branch of the New Haven Railroad, but a large part will be used as freight and car yards. It is thought in realty circles that this purchase meant the carrying out of the proposed plan to run electric trains from Port Chester, N. Y., and from White Plains to the Pennsylvania's Manhattan terminal, Thirty-Third Street and Seventh Avenue, over the New York, Westchester & Boston Railway, the New York Connecting Railway lines and the Pennsylvania tunnel route. The running of fast electric trains over the six-track Harlem branch of the New Haven, from Port Chester to the Harlem River, thence over the New York Connecting Railway bridge, and from Long Island City through the Pennsylvania Railroad tunnels to Thirty-Third Street and Seventh Avenue, is also assured, it is thought. The main line of the New York, Westchester & Boston Railway, the building of which was begun about a year ago, will extend from the Harlem River to Mount Vernon, Pelham, New Rochelle, Larchmont, Mamaroneck, Harrison, Rye and Port Chester

WESTERN POWER PLANS.—The Western Power Company, which is to give battle to the Bay Counties and the Standard for the transmission and sale of electrical energy, has located a site in Oakland, Cal., for a power station, which will be one of the main supply headquarters on a line from the Sierras to the sea. Under the name of the Western Power Company the corporation has purchased a large tract of land in East Oakland on Brooklyn basin, where the plant, which is to mark one of the important links in the chain of power stations which this corporation has planned to construct. The site is on what is known as the Sessions basin, just east of the north arm of the estuary and Lake Merritt, and adjoining the holdings of the American Magnesite Company at the foot of Sixth Avenue. The site has been selected as the main distributing point for Oakland. The company has extensive plans for the development of its main sources of supply, which will be located in the Sierra Nevada Mountains not far from where the main line of the Western Pacific crosses the mountains through Beckwith Pass. The enterprise is closely identified with the Western Pacific interests in New York City. At the head of the new company is Edwin Hawley and other representatives of capital which are concerned directly in the Gould railway development.

THOMPSON-STARRETT COMPANY.—At a meeting of the directors of the Thompson-Starrett Company last week Theodore Starrett resigned the presidency and the executive management of the company's great building business. He was elected chairman of the board, and will remain with the company and retain his interest in its development. The step has been taken by Mr. Starrett to relieve himself of the burden involved in the management of the details of the business, and leaves him free to give his time as one of the building experts of the country to the different features of construction work in the company's business, and also as consulting expert to serve owners and architects generally in such capacity. His offices will be at 49 Wall Street, as before. Mr. Albert B. Boardman was elected president. A semi-annual dividend of four per cent was declared on the common stock of the company, payable July 1 to stockholders of record June 24.

SOUTHERN PACIFIC ELECTRICS.—Advices from Los Angeles, Cal., state that a new coast line railroad, extending from Los Angeles to Santa Barbara, to be electrically operated, is the latest development in the railroad situation. The line is a Harriman enterprise and ultimately will be extended to San Francisco. The Malibu & Hueneme Railroad, surveyed from Santa Monica in a northerly direction and heretofore supposed to be a link of the Western Pacific, is to be the nucleus of the second coast line. It will be the first division of the Southern Pacific to be operated by electricity. If the new road demonstrates that electrical operation can be successfully employed on roads carrying heavy traffic over difficult grades it will mark the beginning of the transformation of all the steam roads on the coast.

MILWAUKEE LIGHTING PLANS.—It is stated that no attempt will be made by the city of Milwaukee to build the municipal lighting system in two years. Capt. Robert Hunt, of Chicago, who has received the contract, told the committee on street lights that the work could be done in that length of time, but that money could be saved by going slowly and building conduits when there is no frost in the ground. He estimated the cost at $1,350,000 and the comptroller does not see how this amount could be raised in two years unless other improvements are abandoned. The committee will recommend that the city enter into a five-year contract with the Milwaukee Electric Railway & Light Company at the rate of $65 a lamp, dating from December 10, 1905.

LONG SAULT POWER.—Governor Hughes has approved the bill of Senator O'Neil, incorporating the Long Sault Development Company, for the purpose of developing electrical power by the use of the waters in the St. Lawrence River in the vicinity of Long Sault Island, St. Lawrence County. This is the bill which was repassed in both houses of the Legislature after being recalled from the Governor, and amended to meet his demand for some return to the state for the grants and privileges conferred by the bill. The bill as amended provides for a scale of payment to the state by the company of $10,000 for the first year, $15,000 for the second year, $20,000 for the third year and $25,000 or more annually thereafter according to the amount of power developed

NAVY SUPPLIES.—The Bureau of Supplies and Accounts, U. S. Navy Department, will open bids in Washington, June 18 and 25, 1907, for the following material. Schedules can be obtained at Washington or upon application to the Navy Pay Office nearest each navy yard.

Material.	Quantity.	Yards.	Sched.
Armatures	2	New York, N. Y.	911
Conduit, enameled steel	3,600 feet	Boston Mass.	906
Electrical supplies	Miscellaneous	Pensacola, Fla.	903
" "	"	Boston, Mass.	906
" "	"	Norfolk, Va.	906
Electric breast drills	4	Washington, D. C.	911
Lamps, arc, 110-volt	26	Boston, Mass.	906
Motor generator set	1	Mare Island, Cal.	802
Switch boxes, steel	4	Boston, Mass.	906

GENERAL ELECTRIC OUTPUT.—The General Electric Company has issued a comparative statement of sales billed to and orders received from customers for the quarters ended April 30, 1903, to 1907, inclusive:

	Orders Received.	Billed Amount.
1907	$18,602,962	$16,035,060
1906	14,639,997	10,339,164
1905	12,020,715	8,672,691
1904	9,943,297	8,966,966
1903	11,460,437	8,245,822

For the whole of last year, the company did a business of over $60,000,000.

STANDARD SAFETY BOILER.—Articles of incorporation have been filed with the Secretary of State of Indiana for the incorporation of the Standard Safety Boiler Company of Indiana, Fort Wayne; capital, $50,000; directors, Samuel K. Gregg, Charles E. Colerick and Walter M. Gregg. This concern will make horizontal and verticle water-tube boilers. Its office is in the Tri-State Building, Fort Wayne.

TELEGRAPHY IN TURKEY.—The London *Times* states that the Turkish Government desires bids on telegraph material for the Haifa-Cadem-Medina line, 930 miles, and for 20 telegraph stations; and on the Medain-Salih-Medina line, 250 miles. Address the Minister of Commerce and Public Works, Constantinople, Turkey.

ARMORDUCT FACTORY.—The Armorduct Manufacturing Company, of London, has just purchased a freehold building site of some seven acres at Wilton, Birmingham, where it proposes to erect large new works at which all its producing plant will be concentrated.

Financial Intelligence.

THE WEEK IN WALL STREET.—Stock market quotations were strong on a decided recovery from another sharp decline at the beginning of the week. Slightly more favorable grain crop advices and the favorable construction of the President's latest address on the railroad question figured as prominent bullish factors, together with the failure of shipments of $2,800,000 gold to Paris to unsettle the New York loan market. The announcement that the corporation counsel of New York City had begun actions to test the franchises owned by the Consolidated Gas Company was responsible for that stock's decline to the lowest price it has touched in years. Amalgamated Copper figured among the weaker specialties on a reduction in quotations for speculative copper. The further break in both

Southern Railway common and preferred, while it appeared to be due to manipulation, caused renewed talk of a cessation of dividends on the latter next autumn. On Friday the market opened strong and advanced in the early trading, but became dull and declined again. Electric stocks were weak and in most all cases the quotations dropped to the lowest level of the year. There was a general rally, however, but the closing figures represented net losses of more or less magnitude on the week's business. Trading on the curb market reflected the conditions dominating the stock exchange. An early break was followed by a rally, and this by another selling movement. Chicago Subway was a principal in the activity and rose about 5 points. Following are the closing quotations of June 4:

NEW YORK.

	May 28	June 4		May 28	June 4
Allis-Chalmers Co.....	9¼	10¾	General Electric.....	—	138
Allis-Chalmers Co. pfd..	26⅞	31	Hudson River Tel.....	—	—
Am. Dist. Tel.....	—	—	Interborough Met. Com.	19	16¼
American Locomotive...	56	58¼	Interborough Met. pfd..	51	46¾
Amer. Locomotive pfd..	102	102	Mackay Cos.....	—	—
American Tel. & Cable..	78	75	Mackay Cos pfd.....	—	—
American Tel. & Tel...	—	—	Marconi Tel.....	—	—
Brooklyn Rapid Transit.	49¼	50¾	Metropolitan St. Ry....	—	—
Electric Boat	33	33	N. Y. & N. J. Tel.....	—	—
Electric Boat pfd.....	80	80	Western Union Tel.....	78	78½
Electric Vehicle	—	—	Westinghouse com.....	142	142
Electric Vehicle pfd....	—	—	Westinghouse pfd.....	—	—

BOSTON.

	May 28	June 4		May 28	June 4
American Tel. & Tel...	117½	108	Mass. Elec. Ry pfd.....	—	57½
Cumberland Telephone..	—	106½	Mexican Telephone.....	—	5
Edison Elec. Illum.....	—	208	New England Telep....	115	113
General Electric.....	137	139	Western Tel. & Tel.....	—	—
Mass. Elec. Ry.....	—	—	West. Tel. & Tel. pfd..	—	—

PHILADELPHIA.

	May 28	June 4		May 28	June 4
American Railways.....	49¼	48	Phila. Electric.....	7⅞	7⅞
Elec. Co. of America...	9⅞	9⅞	Phila. Rapid Transit....	22¼	22¾
Elec. Storage Battery...	49	49	Phila. Traction.....	91¼	91½
Elec. Stor. Battery pfd..	—	—			

CHICAGO.

	May 28	June 4		May 28	June 4
Chicago City Ry.....175		170½	National Carbon.....	71	71
Chicago Edison	—	136	National Carbon pfd...113		110
Chicago Subway.....	—	18½	Union Traction.....	—	—
Chicago Tel. Co..... ..	—	—	Union Traction pfd.....	—	—
Metropolitan Elec. com.	22	23			

ALLIS-CHALMERS SECURITIES.—In a recent discussion of a subject that has been of great interest in electrical circles the *Wall Street Journal* says: "One of the most striking illustrations of the extraordinarily low levels to which the prices of all bonds and more particularly, perhaps, of the industrial issues, have declined during the past few weeks, is found in the case of the Allis-Chalmers first mortgage fives, which are now quoted on the curb at 65 bid and 70 asked, or on approximately a 7½ per cent basis. The bonds, it will be recalled, were authorized last June to the amount of $15,000,000, of which $12,000,000 were issued immediately to pay for new improvements and extensions, and to provide an adequate working capital for the company, the balance of $3,000,000 being reserved for future requirements. They were made a first mortgage on the entire property of the company, whose plants alone at that time were valued at $20,000,000, and were insured for that amount. It was provided that the bonds should be redeemable at the option of the company at 110 after ten years. At the time of issue the stockholders were given the privilege of subscribing pro rata for the bonds at 80 and interest. This came at a time when the condition of the bond market was not much more favorable for the reception of new issues than it is at the present time, and it became necessary to arrange for an underwriting. The underwriting price, as shown by the balance sheets of the company, was 80, less a commission of about 5 per cent, or 75. One of the incidents in the history of the issue was the opposition which was subsequently raised by stockholders to this apparently liberal underwriting profit, but this was overcome when the situation became better understood. By the sale of the bonds, Allis-Chalmers' working capital, after providing for all current liabilities was increased to about $10,000,000, by means of which the company has been enabled to expand its business as never before in its history. Unfilled orders on the books are now stated to be largely in excess of $15,000,000, a fact which would indicate that there is nothing inherently wrong in the position of the bonds. Although, as suggested above, a portion of the issue still remains in the hands of the syndicate participants, a large block of the bonds have within the past few months been sold to European interests."

AMERICAN TELEPHONE STOCK.—Advices from Boston intimate that a new issue of stock will be made by American Telephone some time during the next few months to meet a portion of the 1908 requirements. President Vail believes that the stockholders of the company, numbering over 18,000, will take care of the problems of raising the funds with which to meet the company's growth and expansion. Changes of financial policy are being worked out by the management of wider scope than the public has as yet had time to realize. In general, these changes involve the wiping out of the floating debt of the constituent companies and the keeping of the parent financed ahead of its actual cash requirements, instead of allowing a floating debt to pile up, to be later funded into short term notes or bonds. Presiden Vail is emphatic in his opinion that the American Telephone Company should not wait until the last moment, when its cash resources have been largely expended, before again providing for new issues of securities. The company has ample cash to finance its requirements through the balance of 1907. This will be provide from four payments aggregating 60 per cent paid or to be paid during 1907 on account of the $100,000,000 convertible bonds. As $20,000,000 of this amount was used to retire the collateral trust notes maturing May 1, the company will have remaining a free balance of about $35,000,000 cash with which to meet the necessities of the current year. In banking circles the statement is made that the American Telephone Company will issue $15,000,000 stock at par and a like amount early next year. The expectation of another issue of securities probably accounts for the decline in the stock to 116.

TELEGRAPHONE STOCK.—Some time ago the *Rural New Yorker,* which maintains a department for the answer of inquiries relating to the standing of concerns soliciting the patronage of farmers, advised against the purchase of the stock of the American Telegraphone Company, which stock has for some months been widely advertised, particularly through the mails by circulars. That company having protested to the editor against the publication of this advice, was asked to furnish certain specific information to substantiate the claims made in its circulars. The correspondence is printed in a recent issue of the journal and concludes with a refusal by the company to furnish the information requested, coupled with the statement that all of the stock has been disposed of. The issue of stock was stated to be $5,000,000, one-third of the proceeds of which was to go to the owners of the patents.

CHICAGO SUBWAY.—It is stated from Chicago that J. Ogden Armour is to be the dominant factor in the operations and development of the Chicago subway. He will succeed Albert G. Wheeler as executive head of the Illinois Tunnel Company, the operating corporation of the Chicago Subway Company. That the Armour interests were in the subway to a large extent has been known, but it was not expected this amounted to the direction of the operation of the subway system. It is said to be more than likely that Mr. Armour will become chairman of the executive committee and dictate who will be president of the operating company.

MONTREAL ANNUAL REPORT.—The Montreal Light, Heat & Power Company, in its annual statement for the year ended April 30, will show gross earnings in excess of $3,450,000 and net earnings slightly over $1,920,000. The earnings for the six years the company has been in existence compare as follows:

	Gross.	Net Earnings.
1907	$3,450,000	$1,920,000
1906	3,186,102	1,754,905
1905	2,901,264	1,599,142
1904	2,589,446	1,243,686
1903	1,937,560	900,872
1902	1,760,285	821,217

LACLEDE POWER SOLD.—From St. Louis, Mo., announcement is made that E. W. Clark & Co., of Philadelphia, have acquired for $3,000,000 the Laclede Power Company, of St. Louis, an electric lighting and power company. The final payment of $2,500,000 was made on June 1. The initial payment of $500,000 was made a year ago. With the sale of this company every public utility in St. Louis is owned by outsiders.

TELEPHONE SALE VOTED.—At a meeting last week of the executive committee of the Bondholders' Protective Association, formed to protect the stockholders of the United States Independent Telephone Company, a resolution was passed favoring the sale of the company's properties to the syndicate which recently offered $6,000,000 for them.

LONG ACRE LIGHT.—The stockholders of the Long Acre Light & Power Company have ratified the purchase of the property at 120th Street and East River, New York City. They also elected the following executive committee: E. E. Van Etten, W. H. Lamprecht, Henry B. Harris, John C. Sheehan and G. Tracy Rogers.

GENERAL NEWS

Construction News.

ANNISTON, ALA.—L. H. Kaplan and associates have applied to the City Council for an electric railway franchise in this city.

GADSDEN, ALA.—The City Council has ordered the telephone, telegraph and electric light companies to replace all the wooden poles in the business section of the city with steel poles.

MONTGOMERY, ALA.—The Citizens' Light, Heat & Power Company has increased its capital stock from $50,000 to $200,000.

PINK BLUFF, ARK.—Edward Flad, of St. Louis, Mo., hydraulic engineer, has been appointed by Judge Jacob Trieber of the federal court, to decide what improvements are necessary in order that the plant of the Pine Bluff Light & Water Company may be made adequate to meet the needs of the city. Some time ago the city applied to the courts to have the charter now held by the company cancelled and that a receiver be appointed to take charge of the water plant. Both sides have signed an agreement to abide by the decision made by the engineer.

ALAMEDA, CAL.—Plans are being considered by the electric light commission for the reconstruction of the municipal electric light plant. They call for the construction of a new fire proof building, the installation of a new unit, new boiler and the extension of the power and lighting service. The estimated cost of the improvements is $58,000.

BERKELEY, CAL.—The Berkeley Electric Lighting Company is building a new sub-station at McGee and Hearst Avenues in the northeast part of the city. In the new station a 250-kw motor-generator set will be installed for 500-volt direct-current distribution.

CRESCENT, CAL.—The Crescent City Light, Water & Power Company is preparing to install a large power plant near the mouth of Craigs Creek, and will furnish electricity for lighting and power purposes throughout the western section of this county.

GRIDLEY, CAL.—The City Trustees are said to be considering the question of constructing a water and lighting system.

LAKEPORT, CAL.—The Snow Mountain Water & Power Company, which is developing motor power on Eel River, will furnish electricity to Lakeport and Lake County through the Lake County Electric Light & Power Company. William M. Dean is general superintendent of the Snow Mountain Company.

LOS ANGELES, CAL.—The Home Telephone Company is contemplating an expenditure of $150,000 in improvements and extensions to its system in this city.

OAKLAND, CAL.—The City Council has instructed the city clerk to advertise for proposals for street lighting.

OAKLAND, CAL.—The Board of Supervisors has granted an electric railway franchise, in Fruitvale, to the Oakland Traction Consolidated. The Oakland Traction Company paid $500 for the franchise. The company has also been granted a 50-year franchise for an electric railway in Brooklyn Township.

OAKLAND, CAL.—The Western Power Company has purchased a site at the foot of Sixth Avenue in East Oakland on which it will erect a large power plant. It is said that the plant will have a capacity of from 20,000 to 30,000 horse-power and will cost about $3,000,000. The plant is to be the main auxiliary to the company's water power plant on the Feather River near Oroville. Electricity will be transmitted to San Francisco through a submarine cable.

PASADENA, CAL.—A test of the engines and machinery of the municipal electric lighting plant was made May 22, which proved to be satisfactory in every respect. Manager Charles C. Glass has prepared another statement for the public, in which he shows the necessity for the enlargement of the municipal plant to double the original capacity. He urges the installation of additional engines and other accessories, so that when completed the plant will be adequate for all needs of the city. The cost is estimated at $111,029, making the total cost of the plant nearly $300,000 instead of $125,000 as originally estimated.

SACRAMENTO, CAL.—M. J. Desmond, city clerk, writes that George N. Randle, city surveyor, has been directed to prepare estimates for a municipal electric light plant.

ST. HELENA, CAL.—The Board of Trustees has granted a franchise to Harry W. Pittman, of Calistoga, to construct and operate a transmission line for the distribution of electricity for lighting and power purposes.

SAN FRANCISCO, CAL.—The reorganization of the Pacific Lighting Corporation, of Los Angeles and Eureka, has been effected by the filing of articles of incorporation with the county clerk by which the capital of the company is increased to $20,000,000. In the new articles Alfred Sutro, C. O. G. Miller, George F. Voltman, Charles Holbrook and G. H. Collins are named as having subscribed for one $100 share each. Alfred Sutro states that the company's business had increased to such an extent that it has been thought advisable to enlarge its scope.

STOCKTON, CAL.—The American River Electric Company is contemplating the construction of an auxiliary plant on the north bank of Stockton Channel, the cost of which is estimated at $250,000.

UKIAH, CAL.—The Board of Town Trustees has granted a franchise to the Snow Mountain Water & Power Company, giving it permission to erect transmission lines in certain streets of the town. The franchise is for a term of 50 years.

LEADVILLE, COL.—The Leadville Light & Power Company is contemplating extending its lines to the mines and mills in this district to furnish electricity to the different plants. W. Robertson is manager.

HARTFORD, CONN.—The House of Representatives has passed the resolution granting franchise rights to the Canaan & Berkshire Tramway Company.

NEW BRITAIN, CONN.—At a recent meeting of the railroad committee of the City Council, Calvert Townley, vice-president of the Consolidated Railway Company, stated that in addition to other improvements provided for in this city, the company would increase the capacity of its steam power plant here.

SOUTH NORWALK, CONN.—Arrangements are being made by J. C. Wilson & Company to operate and light their plant by electricity, which will be furnished by the South Norwalk municipal electric light plant. A 60-hp motor will be installed.

HARRINGTON, DEL.—William M. Hope has been appointed receiver for the Harrington Light, Heat & Power Company and the Phoenix Company. Both concerns are now jointly lighting by electricity the town of Harrington, one company owning the real estate and the other the plant and transmission lines.

WILMINGTON DEL.—The Commercial Light, Heat & Power Company has filed a certificate increasing its capital stock from $100,000 to $1,000,000.

WASHINGTON, D. C.—Bids will be received until June 11, 13 and 18, by the Bureau of Supplies and Accounts, Navy Department, for 7 non-water-tight electrical annunciators and 18 water-tight annunciators to be delivered at the Boston Navy Yard. The schedule number is 875.

WASHINGTON, D. C.—Plans have been perfected by the Washington & Rockville Electric Railway Company to extend its line from the terminus in Rockville to Gaithersburg, Md. It is now planned to form a new company, which will be known as the Rockville & Gaithersburg Railway Company. H. W. Fuller is general manager of the Washington & Rockville Electric Company.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until June 18, for furnishing naval supplies at the various navy yards and naval stations as follows: Boston, Mass., schedule 906—conduit, wire, switch boxes, arc lamps, and electrical supplies. New York, N. Y., schedule 911—armatures, etc. Washington, D. C., schedule 911—electric breast drills, etc. Norfolk, Va., schedule 906—electrical supplies. Pensacola, Fla., schedule 903—electrical supplies, etc. Also until June 25, at Mare Island, Cal., schedule 892—motor generator set; schedule 896—sheet copper, etc.; schedule 898—copper wire, etc. Applications for proposals should designate the schedules desired by number. E. B. Rogers, paymaster general, U. S. A.

AMERICUS, GA.—The Street Railway & Power Company recently organized in this city has obtained the necessary franchises and has announced its intention of posting the required bond of $25,000 with the municipal authorities. About $150,000 will be spent for electrical equipment and the street railway system will have an initial circuit of four miles.

ATLANTA, GA.—The special Council Committee on lighting on May 28 accepted the bid of the Georgia Railway & Electric Company for lighting the streets of the city for a term of five years. Under the terms of the contract the company agrees to furnish arc lamps at $60 per lamp the first year; $59 for the second year; $58 for the third year; $57 for the fourth year, and $56 for the fifth year, and for incandescents $28 for the first year; $27.50 for the second year; $27 for the third year; $26.50 for the fourth year and $26 for the fifth year. The new contract will go into affect in April, 1908.

GAINESVILLE, GA.—The North Georgia Electric Company has been reorganized, and the following officers have been chosen: D. W. Stewart, of Xenia, Ohio, president, and W. H. Slack, of Gainesville, secretary. W. H. Carlisle, of Gainesville, was re-elected vice-president and will be the company's executive officer. The company will furnish electricity for lighting and power in Atlanta in competition with the Georgia Railway & Electric Company.

BEARDSTOWN, ILL.—The capital stock of the Beardstown Electric Light & Power Company has been increased from $20,000 to $100,000.

CHICAGO, ILL.—The Union Stock Yards & Transit Company is contemplating the erection of a large power plant at the corner of Morgan and Thirty-ninth Streets to cost $250,000.

MOLINE, ILL.—The People's Power Company is planning to make extensive improvements to its plant and system, which will involve an expenditure of about $250,000.

PARIS, ILL.—The Paris Traction Company will extend its lines to Champaign, Ill.

PLEASANT HILL, ILL.—The capital stock of the Farmers' Mutual Telephone Company has been increased from $2,500 to $20,000.

STERLING, ILL.—The directors of the Sterling Hydraulic Company have made an appropriation of $28,000 for the preliminary work on the power plant to be built at the feeder dam.

BEDFORD, IND.—Plans are being prepared by Bert Baldwin & Company, of Cincinnati, Ohio, for the addition to the power plant of the United States Portland Cement Company, which will include an 800-kw turbine and one of 75-kw capacity.

BLOOMINGTON, IND.—The local electric lighting and heating plant, owned by the Central Indiana Lighting Company, was recently destroyed by fire, causing a loss of about $5,000.

FORT WAYNE, IND.—Bids will be received by the Board of Public Works until June 24, for furnishing and constructing a municipal electric light and power plant, in accordance with the official plans and specifications, which are on file and may be seen at the office of the Board of Public Works at Fort Wayne, and at the office of Owen Ford, 710 Security Building, St. Louis, Mo., consulting and supervising engineer. The specifications are divided into sections as follows: Section 1, boilers and equipments and stack connections. Section 2, stack. Section 3, steam turbine, generators and exciters. Section 4, condenser equipment. Section 5, feed water heater, boiler, feed pumps, separators, pipe work and connections. Section 6, producer gas power plant, gas engines, steam engine reserve, direct-connected generators and exciters. Section 7, arc lamp transformers, switchboard, appliances and station electrical work. Section 8, arc lamps. Section 9, pole line, wiring system and underground work (distributing system). Section 10, transformers and connecting public buildings. Section 11, power plant and cold storage plant. Section 12, dam in Spy Run. Copies of the various sections may be had by applying to the Board of Public Works, Fort Wayne, or Owen Ford, St. Louis, Mo., and enclosing one dollar per section. Bids must be addressed to the Board of Public Works.

MADISON, IND.—The Madison Telephone Company has increased its capital stock to $50,000. The company is preparing to make extensive improvements to its system.

RICHMOND, IND.—Plans and specifications have been prepared by C. R. Mead, of Dayton, Ohio, for improvements to be made to the municipal electric light plant.

BARTLESVILLE, I. T.—At the annual meeting of the Bartlesville Interurban Railway Company the stockholders decided to commence the construction of the road at once. The officers were elected for the ensuing year as follows: Joseph J. Carl, president; George B. Keeler, vice-president, and W. A. Smith, treasurer.

MUSKOGEE, I. T.—The Pioneer Telephone Company is contemplating an expenditure of $25,000 for improvements and extensions to its system in this city.

DAVENPORT, IA.—Plans for the plant of the Davenport Water Power Company have been approved by Major Charles S. Riche, U. S. Engineer, at Rock Island, Ill., and the company is said to be prepared to proceed with the development of the water power of the Davenport-Le-Claire Rapids.

LEAVENWORTH, KAN.—Specifications have been issued for the additions to the electric light and power plant at the federal prison.

TOPEKA, KAN.—The Topeka Edison Company has submitted several propositions to the City Council for lighting the streets of the city as follows: Proposal A—the company will furnish and install all necessary boilers, engines, generators, switchboard and auxiliary station appliances necessary for supplying electricity sufficient for operating 500 series-alternating lamps at 2¼ cents per kw-hour, or 2½ cents per kw-hour for electricity for magnetite lamps, less one-quarter of a cent per kw-hour in each case if the bills are paid on or before the fifteenth day of the month. Proposal B—the company will furnish electricity and lamps for series alternating lamps for $38.10 each per annum, or $33.35 for magnetite lamps. Under this proposal the city will own and maintain the pole line and trim and maintain the lamps. Proposal C—the company will furnish electricity and lamps and trim the latter for $46.35 each for the series alternating system, and $42.15 each for the magnetite system. Under this proposal the city will own and maintain the pole line. Proposal D—the company will provide all necessary machinery, circuits and lamps, and furnish the complete service for $57.50 per lamp on the series alternating system, or $55 per magnetite lamp. This proposal is based upon the purchase of the company from the city of its poles. Proposal E—is a duplicate of proposal E except that the company will furnish all new poles instead of acquiring those belonging to the city. Under this proposal the company will furnish the service for $60 per lamp on series alternating system and $57.50 for each magnetite lamp. Each of the foregoing proposals relating to the alternating system, is based on standard 450-watt lamps, all-night service for 500 lamps for a period of ten years. According to the estimate submitted by Prof. R. M. Freeman, the city could operate 500 lamps at $47.37 each, or $23,680 per year, by rebuilding the municipal electric light plant at a cost of $65,000. The 500 lamps at $55 per lamp would cost the city $27,500 per year.

LOUISVILLE, KY.—The Louisville Railway Company announces an issue of six per cent notes (secured by bonds), the proceeds of which will be used for the purchase of new rolling stock and extending the suburban line to Bardstown.

PLAQUEMINE, LA.—The capital stock of the Plaquemine Electric Light & Power Company has been increased from $30,000 to $50,000. The company will increase the capacity of its plant by the installation of a 100-hp producer gas engine, one 50-kw, alternating-current, 2200-volt, two-phase, 60-cycle generator, and a 30-hp motor water pump. J. H. Savage is president.

LINCOLN, ME.—Mr. McGregor is contemplating extensive repairs to his mill during the present season, which will include an extension to the electric lighting plant and the installation of another large boiler.

LUBEC. ME.—The construction of a new electric light and power plant in this place is now under consideration. Plans and specifications for the proposed plant are in the hands of C. H. Clark.

ROCKLAND, ME.—The Rockland, Thomaston & Camden Street Railway Company is contemplating increasing the capacity of its power house and is planning to purchase a 200-kw to 300-kw, 2080-volt, 125-cycle, single-phase generator, direct or belt connected with engine, switchboard and instruments complete.

AYER, MASS.—The new owners of the electric light plant are contemplating extensive improvements to the plant and are preparing to establish a day service for lighting and power. They are now rebuilding the lines and will replace the present arc and incandescent lamps with new lamps.

CHICOPEE, MASS.—At a special meeting held recently the Board of Aldermen voted to refer the ordinance authorizing the expenditure of $19,000 for improvements to the municipal electric light plant, to the electric light commission, which will be appointed soon.

GREAT BARRINGTON, MASS.—The Consolidated Railway Company will build the proposed extension from Great Barrington to Canaan this year.

PITTSFIELD, MASS.—The Pittsfield Electric Railway Company has filed a mortgage to the Berkshire Loan & Trust Company, of Pittsfield, to secure an issue of $100,000 in bonds, the proceeds of which will be used for additions to its system and for payment of floating debt.

NORTHAMPTON, MASS.—The Northampton Electric Lighting Company has petitioned the State Gas and Electric Commission for permission to issue $100,000 in bonds, the proceeds to be used for improvements to its system.

STONEHAM, MASS.—The Board of Selectmen has entered into a contract with the Edison Electric Illuminating Company for lighting the streets of the town for a term of five years.

WILLIAMSTOWN, MASS.—The prudential committee of the fire district has renewed the contract for lighting the streets of the town with Williamstown Gas Company for a term of five years. The price agreed upon is the same per lamp as in the last contract, which is $65 per lamp per year, but the company agrees to furnish 2000-cp lamps instead of 1200 candle-power as at present. There are about 32 arc lamps and 62 in candescent street lamps in use at the present time.

BAY CITY, MICH.—Franchises have been granted by the City Council to the Detroit, Bay City & Western Railroad and the Bay City & Port Huron Railroad Companies to operate their lines through this city to Detroit.

BOYNE CITY, MICH.—The Boyne City Electric Company is developing a water power to operate its electric light plant which is now run by steam power, which when completed will greatly increase the capacity of the plant.

HANCOCK, MICH.—Plans are now being considered for the erection of a municipal electric light plant in this city.

HANCOCK, MICH.—The Houghton County Electric Light Company, of Houghton, has submitted the following offer for street lighting to the city of Hancock: Three-year contract, $84 per lamp per year; five-year contract, $81 per lamp per year, and 10-year contract, $75 per lamp per year; incandescent lighting, ten cents, eight cents and seven cents per kilowatt hour respectively. When the number of lamps in use exceeds 50 the rates will be $83, $80 and $75, respectively. When the number exceeds 60 the rates will be $82, $79 and $74, respectively. When the number exceeds 70, the rates will be $81, $78 and $73, respectively, reducing the cost per lamp $1 per year.

LANSING, MICH.—Contracts have recently been placed for two water turbines of 2000 horse-power and also for two 540-kw generators, which will be installed in the power plant at Piatt Dam, where the present water power plant will be dismantled. The company will also install a water power plant at Dimondale, and will erect an auxiliary steam power plant on the bank of the Green River at Ottawa Street. Plans for the latter plant have not been completed. The company is also contemplating additional power plants to its system at Grand Ledge, Eagle and Portland. The first three plants will be inter-connected and will each have a capacity of 2000 horse-power.

MARQUETTE, MICH.—The Marquette County Gas & Electric Company has applied to the City Council for a new contract for lighting the city for a term of years. The old contract expired over a year ago. J. W. McCorkingdale is manager.

MENOMINEE, MICH.—Plans are being perfected by the Hydro-Electric Company, of Oshkosh, Wis., for the construction of a power plant on the Peshtigo River and to obtain franchises from this city and Marinette for the purpose of constructing an interurban railway through Menominee and Marinette Counties. C. O. Johnson, of Oshkosh, Wis., is manager of the company.

NEGAUNEE, MICH.—A proposition for the purchase of the municipal electric lighting system for $35,000 has been submitted to the city by the Granger-Farwell interests, of Chicago, Ill., which already operate the street railway system and gas plant here. A special election will be held for the purpose of voting on the question of accepting the proposal or whether to issue $18,000 in bonds for rebuilding the city plant.

CANNON FALLS, MINN.—George E. Wilson, city clerk, writes that the city is not contemplating the construction of a municipal electric lighting plant as reported in our issue of May 25.

CHISHOLM, MINN.—Plans are being made to increase the capacity of the village electric light plant, which will involve an expenditure of about $20,000. A gas engine will be installed. Work will soon begin on the construction of the addition to the power house, and a day service will be established about August 1. Plans are being considered for the development of the water power of Sturgeon River, but nothing will be done for the present.

CROOKSTOWN, MINN.—W. A. Martin is contemplating the construction of a street railway system in this city.

FERGUS FALLS, MINN.—The only bid received May 28 by the City Council for construction of dam and power house for the municipal electric light plant was submitted by Berge & Hodson, for $44,840.

MINNEAPOLIS, MINN.—The Minneapolis, Rochester & Dubuque Traction Company is soliciting bids for the construction of its road.

ST. CHARLES, MINN.—The City Council has decided to call a special election to vote on the proposition to bond the city for $11,000 for the purpose of purchasing the electric light plant for the city.

MERIDIAN, MISS.—The Meridian Light & Railway Company is planning extensive additions and improvements to its system in this city, which will involve an expenditure of about $60,000. A. B. Patterson is general manager.

JACKSON, MO.—Bids will be received about July 1 for the proposed electric light plant and water works pumping station, for which Hiram Phillips, of St. Louis, is preparing plans. The cost of work is estimated at $35,000. G. W. Vineyard is chairman of the committee.

STANBERRY, MO.—John A. Shower has purchased the electric light plant in this place for $18,000. The plant will be improved and put into operation.

KALISPELL, MONT.—The Flathead Valley Water Power Company has engaged H. M. Byllesby & Company, of Chicago, Ill., as consulting and operating engineers for the development of a water power on the Big Fork River situated at Big Fork. This development is to increase the present capacity of the plant.

BENSON, NEB.—The Omaha Electric Light & Power Company is planning to construct a new sub-station in this place at a cost of $11,000.

LAS VEGAS, NEV.—Application has been made to the County Commissioners by Hans Olsen and C. W. Paterson, of Caliente, asking for a franchise to erect an electric transmission line from Spring Valley to Pioche and Caliente and the surrounding country.

JERSEY CITY, N. J.—Bids will be received until June 14 by the Board of Trustees of the City Hospital for the erection of a power house and other buildings on Baldwin Avenue.

MORRISTOWN, N. J.—P. V. Stryker, of Bernardsville, writes that the proposed electric light plant to be constructed at Morristown, of which he is general manager, will cost about $200,000.

ANTWERP, N. Y.—The flour mills and electric light plant owned by Joseph A. Baumert was recently destroyed by fire.

KINGS PARK, L. I., N. Y.—Bids will be received at the office of F. A. Wheeler, purchasing steward, State Commission in Lunacy, Wards Island, N. Y., until June 20 for supplying automatic blowers in the power plants located at Central Islip State Hospital, Central Islip, and at Kings Park Hospital, Kings Park, L. I., N. Y.

NEW YORK, N. Y.—The Snare & Triest Company has secured the contract for installing the ventilating system and electrical equipment in the Manhattan subway station of the Williamsburg Bridge for $52,270.

NEW YORK, N. Y.—Bids will be received until June 10, by Beekman Winthrop, assistant secretary, Treasury Department, Washington, D. C., for furnishing and installing certain electric lighting fixtures in the new United States Custom House, New York City, N. Y.

POTSDAM, N. Y.—The village authorities have applied to the State Commission of Gas and Electricity for permission to supply electricity for lighting purposes to private consumers. The capacity of the village plant is sufficient to supply about twice the number of lamps that are now being furnished, and it is proposed to supply about 3000 lamps at once to private consumers and to extend the private service to 5000 lamps in the future.

NEW YORK, N. Y.—We are informed that no bids were received on May 28 by the Department of Water Supply, Gas and Electricity for furnishing, installing, maintaining and reserving for the use of the high pressure fire service, all apparatus and equipment necessary for generating and transmitting and furnishing electricity at each of the high pressure fire service pumping stations located at Oliver and South Streets and Gansevoort and West Streets, Manhattan Borough, and at Furman and Joralemon Streets and at Willoughby and St. Edwards Streets, respectively, in Brooklyn Borough. John H. O'Brien is commissioner.

ROCHESTER, N. Y.—The Rochester Railway & Light Company has awarded a contract to the General Electric Company, Schenectady, for a 3000-kw, three-phase, alternating-current generator. The machine will be installed in the power plant of the company located at the foot of Furnace Street and will be used on the general lighting circuit.

ROME, N. Y.—The Rome Gas, Electric Light & Power Company has submitted a second proposition to the Board of Public Works in reference to the electric light contract. The company offers arc lamps at $95 per lamp per year for a two-year contract, and $90 per lamp per year for three years' contract; the third price is the same as was previously submitted, $85 per lamp per year for a five-year contract.

SYRACUSE, N. Y.—The Cortland County Traction Company has been granted authority by the State Railroad Commission to increase its capital stock from $320,000 to $1,000,000 and to issue a mortgage for $2,000,000. The proceeds will be used for making extensions to its system.

UTICA, N. Y.—The Utica Gas & Electric Company has made application to State Commission of Gas and Electricity for permission to issue $2,000,000 five per cent 50-year bonds under its $5,000,000 mortgage. The company also asks for authority to acquire the Herkimer County Light & Power Company, the Glens Falls Gas & Electric Light Company, the Consolidated Light & Power Company, of Whitehall, and 51 per cent of the capital stock of the United Gas, Electric Light & Fuel Company.

RALEIGH, N. C.—Prof. C. W. Thomas, of West Raleigh, writes that bids will probably be called for in July or August for a heating and power plant for the North Carolina College of Agriculture and Mechanical Arts.

WILMINGTON, N. C.—R. M. Sheppard, of Wilmington, secretary and treasurer of the Tidewater Power Company, writes that this company is to take over the control of the Consolidated Railways, Light & Power Companies and make extensions into suburbs of the city, and will also transmit electricity from the plant of the Rockingham Power Company, a distance of 116 miles.

VALLEY CITY, N. D.—H. T. Halverson, city clerk, writes with regard to the electric light plant, that the service has become inadequate, and as the citizens are opposed to issuing bonds to enlarge the plant, it has been decided to sell the plant to the highest bidder.

ARLINGTON, OHIO.—Plans for the construction of a municipal electric light plant have been accepted by the City Council. George Champe, of Toledo, will supervise the construction of the plant.

BARBERTON, OHIO.—Plans and specifications are being prepared by the Cleveland Engineering Company for the Orrville, Doylestown & Barberton Railway Company.

COLUMBUS, OHIO.—The Central Union Telephone Company is contemplating the erection of a new building on Sherman Street to cost $19,000.

HAMILTON, OHIO.—The Board of Public Service on May 25 awarded the following contracts in connection with the improvement of the city electric light plant. To the General Electric Company, Schenectady, N. Y., one 500-kw turbine generator, $16,606; city arc lighting system, including 310 incandescent street lamps, $11,865, and switchboard, $2,681; to the Westinghouse Machine Company, Pittsburg, Pa., one 500-kw generator, $17,500; to Henry R. Worthington and Laidlaw-Dunn-Gordon Company, New York, N. Y., two condensers, $3,400; to the Fort Wayne Electrical Company, Fort Wayne, Ind., wire, $3,477, and the Bissell Company, Toledo, Ohio, poles, $1,825.

JUNCTION CITY, ORE.—B. F. Howard, proprietor of the Junction City electric light plant, has filed with the county clerk a notice of appropriation of the waters of Bear Creek, a stream about ten miles distant, for the purpose of generating electricity for light and power. Mr. Howard states that he intends to organize a company in the near future and will build a large electric power plant there for the purpose of furnishing electricity for light and power for Junction City, Eugene and other cities in the upper valley.

SALEM, ORE.—Sealed proposals will be received by the State Board of Public Commissioners until June 11 for lighting the capitol, penitentiary, insane asylum, reform school, mute school and the school for the blind. W. N. Gatens is clerk of the board.

AVOCA, PA.—Plans for increasing the capacity of its plant are being contemplated by the Standard Electric Light, Heat & Power Company, which include the installation of a 300-kw engine type alternator, the reconstruction of the present lines and extension of its system in new territory. Frank Howard is manager.

HUNTINGDON, PA.—The Logan Light & Power Company, which was organized some time ago by the Wilson-Mattern Company to develop a hydro-electric power at Spruce Creek, has been incorporated by Wallace Wilson, of Alexandria; George C. Wilson, of Tyrone, and Frank Mattern, of Warriorsmark. The company has secured franchises in Tyrone and Bellwood to erect transmission lines for the distribution of electricity and may extend its lines to Altoona. Electricity will also be furnished to smaller towns in the neighborhood of its plant. Through plants already established and other hydro-electric plants contemplated, the Wilson interests now practically cover the entire Juniata Valley, extending from Bellwood, through Huntingdon to Lewiston. At Lewiston the Woods-Wilson Company is applying for a franchise as the Juniata Valley Light, Heat & Power Company, and a contract for lighting the town for a term of five years is under consideration by the town officials. Electricity for lighting this part of the system will be furnished from the Penns Creek hydro-electric plant, which the company proposes to develop.

PITTSBURG, PA.—The Diamond Light & Power Company has applied to the City Council for a franchise to erect poles and wires in this city for the transmission of electricity for heat, light and power purposes. Frank McCarr is interested in the company.

SCRANTON, PA.—Plans have been completed for the construction of a power house for the Scranton Electric Light & Heating Company.

SHARON, PA.—The Bell Telephone Company is planning extensive improvements to its system in this city, which include the construction of a new exchange building, new switchboard, new instruments and placing its wires underground in the business section of the city. The work contemplated will cost from $100,000 to $125,000.

SUNBURY, PA.—The Sunbury Edison Electric Illuminating Company, the Sunbury Gas Company and the Sunbury & Northumberland Electric Street Railway Company have been consolidated. It is said that a number of improvements will be made which will increase the capacity of both the gas and electric plants. C. J. Callahan has been elected president and general manager of the company, and G. W. Beck general superintendent.

YORK, PA.—The merger of the York Telephone Company with the York Telegraph & Telephone Company has been approved by the stockholders of the former company. The purpose of the merger is to give the company a broader charter which will enable it to build its long distance lines. The York Telephone & Telegraph Company will at once extend its lines into Philadelphia and Pittsburg and will eventually extend them throughout the state. The money which the company will acquire by its new bond issue will be used in the erection of the new building on the corner of South Beaver Street and Mason Alley, and extensions to its system in this vicinity.

PHENIX, R. I.—At a recent meeting of the Harris Lighting District a committee, comprising J. Ellery Hudson and Everett W. Whitford, was appointed to enter into a contract with the Narragansett Electric Lighting Company to light the streets of the district for a term of 10 years at a rate not to exceed $12 per year per lamp.

SIOUX FALLS, S. D.—The Sioux Falls Light & Power Company is contemplating extensive additions to its system, and will build a retaining wall and dam, power house, flumes, and purchase equipment for the power house, which will involve an expenditure of about $100,000. J. J. Bennett is president.

JONESBORO, TENN.—A company is being organized to build an electric railway from Jonesboro to Johnson City. A. L. Shipley is interested in the project.

BROWNSVILLE, TEX.—The City Council has appointed a committee to secure estimates on the cost of a lighting plant and water works system, with a view of authorizing an election to vote on the proposition of issuing bonds for construction of the plants.

DALLAS, TEX.—The County Auditor has been authorized to advertise for bids for the construction and installation of an electric light plant in the court house.

DENISON, TEX.—Contracts have been placed by the Denison Light & Power Company for two 250-kw Western Electric, alternating-current, 60-cycle, 2300-volt generators, direct connected to a cross-compound condensing engine. The Westinghouse alternating-current generator, with engine, exciter, switchboard, etc., in use at present, which originally cost about $17,000, will be sold for $8,000. W. A. Everitt is manager.

HEREFORD, TEX.—H. G. Tucker, of Hereford, writes that it is proposed to construct an electric light plant and gas works at a cost of $8,000.

MORETOWN, VT.—Plans are being made by Almon & Moody, owners of the electric power plant located on the Mad River in this place, to develop another water power on the Mad River, about two miles from their present plant. The plant will be built during the summer of 1908 and will cost about $100,000.

OLYMPIA, WASH.—Bids have been called for by the State Board of Control for an 85-hp electric motor and a 3000-gallon pump for the Eastern Washington Hospital for the Insane at Medical Lake.

BALDWIN, WIS.—The Rush River & Eau Claire Telephone Company has filed an amendment to its articles of incorporation, increasing its capital stock from $3,520 to $12,000.

CAROLINE, WIS.—The Farmers' Independent Telephone Company has filed an amendment to its charter increasing its capital stock from $2,500 to $10,000.

MILWAUKEE, WIS.—The Common Council has accepted the recommendation of the commitee instructing the city attorney to withdraw the pending suit against the Milwaukee Electric Railway & Light Company, providing that a contract be entered into with the company for five years, beginning with Dec. 15, 1905, at $65 per lamp per year. This is the rate offered by the company to the city at the time the contract expired, which was refused by the Aldermen, in the belief that the municipal electric light plant could be completed within two years.

SHULLSBURG, WIS.—The citizens are contemplating an issue of $12,000 in bonds for an electric lighting plant.

MORDEN, MAN., CAN.—The citizens have voted in favor of installing a municipal electric lighting plant. Address S. Scott.

DALHOUSIE, N. B.—Bids will be received until June 19 by Alexander J. Blane, town clerk, for the following work: Pumping engine; two boilers; dam and gate house, furnishing material and construction of power house. Willis Chipman, 103 Bay Street, Toronto, Ont., is engineer.

ST. MARTINS, N. B.—The stockholders of the St. Martins Telephone Company have elected C. M. Bostwick, president; W. E. Skillen, vice-president; W. M. Jarvis, R. O. Stockton and C. D. Trueman, directors.

HALIFAX, N. S.—The Nova Scotia Telephone Company will increase its capital stock from $700,000 to $900,000. The proceeds will be used for extensions to its system.

ARNPRIOR, ONT.—Thomas Moran has obtained a franchise here and will install an electric lighting plant, obtaining the power at Galetta.

BRANTFORD, ONT.—Plans for the amalgamation of the Brantford Street Railroad Company, the Grand Valley Radial Railroad Company and the Woodstock Railroad Company have been consummated. The new company will operate under the name of the Grand Valley Radial Company and is headed by M. A. Verner, of Pittsburgh, Pa. Track mileage is to be doubled and the system extended to Cainsville in the east. A line will also be built from Port Dover, via Mount Pleasant, Waterford and Simcoe.

CHATHAM, ONT.—The Bell Telephone Company has decided to install a new plant here and put in an underground system.

COBALT, ONT.—J. W. Fitzpatrick and Hon. Frank Latchford, directors of the new Nipissing Central Railroad Company, are interested in the construction of a branch to connect New Liskeard and Cobalt. The motive power will be electricity and it is expected the line will be put under contract during the present month.

PORT ARTHUR, ONT.—The Hydro-Electric Power Commission has submitted rates to the City Council for which electricity can be supplied to the city. The price will be $17.50 per horse-power per year for 3000 horse-power or under; $16.50 for 6000 horse-power, and $15.50 over that amount.

POTSDAM, ONT.—The ratepayers have voted $3,500 for the installation of an electric lighting system and $2,200 for the plant.

WOODSTOCK, ONT.—The city has applied to the Ontario Railway and Municipal Board for permission to issue $7,045 in bonds for extensions to the electric lighting system.

MONTREAL, QUE.—R. Forget, a director of the Montreal Light, Heat & Power Company, states that the company will sell its gas plant and gas business to the city of Montreal for $25,000,000.

Company Elections.

DENVER, COL.—At the annual meeting of the Denver Gas & Electric Company the old board of directors was re-elected and has chosen the following officers for the ensuing year: Emerson McMillin, of New York, N. Y., chairman; Henry L. Doherty, New York, N. Y., president; Frank W. Frueauff, New York, N. Y., vice-president and general manager; William J. Barker, Denver, vice-president and general superintendent; C. N. Stannard, Denver, secretary; John T. Brady, Denver, treasurer; A. H. Ostram, New York, N. Y., assistant secretary.

SYRACUSE, N. Y.—At a special meeting of the stockholders of the Syracuse Lighting Company the following directors were elected: John J. Cummins, A. K. Hiscock, Hendrick S. Holden and Louis L. Waters, of Syracuse; George S. Philler, J. C. De Long and Louis Lillie, of Philadelphia, Pa., and Henry Seligman and Stephen Peabody, of New York, N. Y.

UTICA, N. Y.—At a meeting of the directors of the Utica Gas & Electric Company held April 15 the following officers were elected: Anthony N. Brady, president; William E. Lewis, vice-president; M. Jesse Brayton, secretary; George H. Stack, treasurer, and William J. McSorley, auditor.

New Industrial Companies.

THE ADDISON W. BROWN ELECTRIC COMPANY, Brooklyn, N. Y., has filed articles of incorporation with the Secretary of State. The capital stock is $10,000 and the directors are: A. W. Brown, C. A. Brown and Ella M. Brown, all of Brooklyn.

THE CONNECTICUT ELECTRICAL EQUIPMENT COMPANY, of Meriden, Conn., has been incorporated by E. B. Wilcox, president and treasurer; A. B. Wilcox, secretary, and L. T. Fuller.

THE DIXIE LIGHTING COMPANY, of Wilson, N. C., has been chartered with a capital stock of $12,500 by J. R. Hardy, J. R. Joyner, William Teiser and others. The company proposes to manufacture and deal in lighting and heating appliances.

THE JOHNSON-KENNEDY ELECTRIC COMPANY, of Cincinnati, Ohio, has been organized by Claude Johnson, who has been for the last ten years with the Creaghead Engineering Company. The company is capitalized at $10,000 and has taken quarters at 244 East Fifth Street. The company proposes to conduct a general electric supply business. J. M. Kennedy is president and treasurer of the company, and Mr. Johnson will be vice-president and general manager.

THE OLENIN ELECTRIC COMPANY, of Binghamton, N. Y., has been incorporated with a capital stock of $75,000 for the purpose of manufacturing the new Olenin luminous arc lamp. The incorporators are John D. Frear and William Betts.

New Incorporations.

WILMINGTON, OHIO.—The Clinton Home Telephone Company has been incorporated, with a capital stock of $125,000, by C. R. Fisher, D. J. Toland, J. S. Kimbrough, W. G. Fisher, S. S. Outcalt, W. F. Hains and G. P. Thorpe.

BURLINGTON, OKLA.—The North Union Telephone Company has been incorporated, with a capital stock of $10,500, by Henry Welch and others.

CARMEN, OKLA.—The Rich Valley Telephone Company has been incorporated with a capital stock of $10,000 by A. G. Melrose, E. Hughes and Walker Milum.

CAPRON, OKLA.—The Capron Telephone Company has filed articles of incorporation, with a capital stock of $7,000. The incorporators are: F. J. Fisk, J. M. Daughty, Charles E. Curran, Charles Swartz, J. C. Welker, William Webb and E. U. Anderson.

DOVER, OKLA.—The Dover Telephone Company has been incorporated, with a capital stock of $500, by A. L. Mayes and others.

DRIFTWOOD, OKLA.—The Citizens' Telephone Company has been incorporated, with a capital stock of $3,500, by H. J. Kraigh, J. W. Gass, A. C. Hoeffer, W. E. Barkley, W. H. Cloyd and S. C. Lambert.

HOOKER, OKLA.—The Hooker Telephone Company has been incorporated, with a capital stock of $20,000, by N. O. Stephenson and others.

KINGFISHER, OKLA.—The Huntsville Telephone Company has been incorporated, with a capital stock of $2,700, by M. B. Gilliland, E. M. Hale and Joseph Thomas.

LONGDALE, OKLA.—The Dane & Longdale Telephone has been incorporated with a capital stock of $1,000 by C. M. Richards, A. G. Brewer, H. R. Lowden and others.

MERIDIAN, OKLA.—The Meridian Telephone Company has been incorporated with a capital stock of $3,000. The directors are W. M. Allen and others.

OKLAHOMA CITY, OKLA.—A charter has been granted to the Oklahoma City Electric Railway Terminal Association, of Oklahoma City, Pittsburg, Pa., and New York, N. Y., with a capital stock of $1,000,000. The incorporators are Guy V. McClure, Warren F. Moore, Calos and Fred S. Combs and J. J. Johnson, all of Oklahoma City.

READING, OKLA.—The Reading Telephone Company has been incorporated, with a capital stock of $1,000, by G. T. Dixon, of Okarche; G. B. Caron and B. F. Coles. of Reading.

SHATTUCK, OKLA.—The Farmers' Mutual Rural Telephone Company has been incorporated with a capital stock of $1,500 by T. J. Eldridge and others.

TEXHOMA, OKLA.—The Texhoma Telephone Company has filed articles of incorporation with a capital stock of $5,000. The directors are S. J. Osborne, T. E. Osborne and Gertrude Osborne, all of Texhoma.

VICI, OKLA.—The Vici Rural Telephone Company has been incorporated, with a capital stock of $5,200, by O. W. Hauser and others.

WALLING'S STORE, OKLA.—The Whiskey Creek Telephone Company has been incorporated, with a capital stock of $5,000, by C. M. Barnes and others.

WICHITA FALLS, OKLA.—The Bowman & Lake Creek Telephone Company has been incorporated with a capital stock of $5,000 by J. L. Cobkey and others.

WOODWARD, OKLA.—The Indian Creek Telephone Company has been incorporated, with a capital stock of $500, by A. W. Green and others.

PORTLAND, ORE.—Articles of incorporation have been filed for the Eugene & Eastern Railway Company by A. Welch, E. W. Hall, F. W. Waters and Charles A. Hardy.

PORTLAND, ORE.—The Rainier Electric Company has been formed with a capital stock of $25,000 to build an electric railway from Rainier to Portland. The incorporators are Alex Sweek, Carleton Lewis and W. C. Morris.

YORK, PA.—A charter has been granted to the York Telephone & Telegraph Company by D. F. Lafean and others. The company has a capital stock of $500,000.

WAGNER, S. D.—The Wagner, Lake Shore & Armour Traction Company has filed articles of incorporation with the Secretary of State, with a capital stock of $1,000,000. The company proposes to construct an electric railway from Wagner to Mitchell, a distance of 65 miles. The incorporators are: A. H. Pease, John Steransky, John Absher, of Wagner; Albert Amundson, of Lake Andes, and E. P. Wanzer, of Armour.

ACTON, TEX.—The Acton Telephone Company has been incorporated, with a capital stock of $8,125, by G. W. Carmichael, B. N. Roff and others.

BENAVIDES, TEX.—The Benavides Telephone Company has been chartered with a capital stock of $5,000 by John Ball and others.

BLOOMING GROVE, TEX.—The Home Light, Water & Ice Company, of this place, has been incorporated, with a capital stock of $30,000.

BURNET, TEX.—The Smart Telephone Company has been incorporated with a capital stock of $10,000 by D. C Reed and others.

CHILLICOTHE, TEX.—The Independent Telephone Company has filed articles of incorporation, with a capital stock of $25,000. The incorporators are F. L. Moffett and others.

GALVESTON, TEX.—The Manning Telephone Company has been incorporated with a capital stock of $15,000 by W. J. Manning, W. R. Alford and M. Henderson.

MALONE, TEX.—The Manning Telephone Company has been incorporated with a capital stock of $15,000 by W. J. Manning and others.

SPRINGTOWN, TEX.—The Springtown Telephone Company has filed articles of incorporation, with a capital stock of $5,000, by J. T. Roberson and others.

WEST, TEX.—The Home Telephone Company, of West, McLennan County, has filed articles of incorporation, with a capital stock of $25,000, by E. Rotan and others.

MANTI, UTAH.—The Manti Telephone Company has filed articles of incorporation with a capital stock of $10,000. The directors are A. H. Christensen, A. O. Anderson, E. D. Sorenson and Stanley Crawford.

SPOKANE, WASH.—Articles of incorporation have been filed with the Secretary of State for the Panhandle Electric Railway Company, with a capital stock of $1,000,000. The incorporators are: Amasa J. Smith, of Spokane; John R. Jones, of Hillyard, and Harry M. Wallace, of Spokane.

GRANTSBURG, WIS.—The Farmers' Independent Telephone Company has been incorporated, with a capital stock of $4,000, by R. J. Meland and others.

LAMARTINE, WIS.—Articles of incorporation have been filed by the Woodhull Telephone Company by J. A. Stratz, Frank Schaefer and O. S. Fenner. The company is capitalized at $2,500.

OSHKOSH, WIS.—Articles of incorporation have been filed for the Northern Hydro-Electric Power Company, with a capital stock of $2,000,000, by Frank H. Josslyn, Charles H. Hartley, John L. Powers and others.

BUFFALO, WIS.—The Diamond Telephone Company has been incorporated, with a capital stock of $500, by Thomas Donahue and others.

Legal.

EDISON PATENT FOR KINETOGRAPHIC CAMERA HELD VALID.—The Edison reissued patent No. 12,037 (original No. 589,168), for a kinetographic camera, is held, as to claims 1, 2 and 3, not to have been anticipated and to disclose patentable invention in the means shown for imparting an intermittent movement to the tape film while passing in front of the lens, which consist of a sprocket wheel having teeth which enter holes in the edge of the film and advance it positively, evenly, and rapidly. And such claims are held not to be infringed by a camera in which the film is moved by frictional contact alone, but is infringed by one in which the film is moved by a reciprocating two tined fork carrying studs or pins which engage holes on either edge of the film. Edison vs. American Mutoscope & Biograph Company, United States Circuit Court of Appeals, Second Circuit, 151 Fed. Rep. 767.

RESERVATION OF EXCLUSIVE RIGHT TO MAINTAIN ELECTRIC LIGHT SYSTEM IN STREET HELD INVALID.—The owners of land adjacent to a city platted the same into lots and blocks and executed deeds to the city for the streets, alleys and public grounds. But, in the deeds, the grantors reserved to themselves the exclusive right to construct and operate street railways and to erect poles for lighting or telegraph purposes. Thereafter the city granted to one Jones a franchise to erect and operate an electric light plant for the purpose of supplying electricity to the municipality and its inhabitants. The plaintiff, one of the original grantors to the city, brought an action against Jones to restrain him from interfering with the exclusive right which the plaintiff reserved at the time of the conveyance of the land to the city. It was held that the reservation in the deed was invalid for the reason that it was contrary to public policy and tended to create a monopoly. A monopoly, in its strict sense, is an exclusive right granted by the state to a few, giving them control of something which before was of common right. But the term, as now understood, is not confined to the above limits. It embraces any combination or contract, the tendency of which is to prevent competition in its broad and general sense and to control prices to the detriment of the public; and the form assumed is immaterial. The enforcement of the right claimed by the plaintiff would result in binding the city for all time to look to him for light, telephones, transportation, etc. Under the terms of the reservation he might use the right or not at his option. And if he did not elect to move in the premises he could prevent others from moving. A more glaring violation of every principle which forbids the creation of a monopoly could hardly be imagined. Jones vs. Carter, Court of Civil Appeals of Texas, 101 S. W. Rep. 514.

Obituary.

MR. CHARLES KENMOUTH STEARNS, an electrical engineer, died recently at the Boston City Hospital. Mr. Stearns was born at Newton Center, Mass., in 1864, and was a graduate of the Massachusetts Institute of Technology. He worked for the old Thomson-Houston Electric Company in Boston, Mass., and in St. Paul, Minn., and was employed as assistant engineer in installing electric power on the Nantasket Beach branch of the New York, New Haven & Hartford Railroad. He was a member of the American Institute of Electrical Engineers and of the American Society of Mechanical Engineers.

Personal.

MR. F. M. SACKETT has been appointed president of the Louisville Electric Light Company, Louisville, Ky., to succeed Mr. Udolpho Snead, resigned.

MR. GEORGE G. WARD, vice-president of the Commercial Cable Company, is reported as having arrived in England on the new *Adriatic*. He will spend the summer on the other side.

MR. F. S. MILLS, formerly of the General Electric Company sales department, has been appointed general superintendent of the Monterey County Gas & Electric Company, of Monterey, Cal.

MR. OTTO E. FALCH, JR., recently chief engineer of the Pacific Coast department of the Otis Elevator Company, has opened offices to engage in consulting electrical and mechanical engineering at 850 and 852 Monadnock Building, San Francisco.

MR. JAMES T. MAXWELL was married May 25 to Miss Lillian B. Ross, of Woodbury, N. J. Mr. Maxwell is the general agent of the Philadelphia Electric Company, and one of the organizers of the Philadelphia section of the Illuminating Engineering Society.

MR. WILLIAM J. BARKER, president of the Northern Colorado Power Company, will succeed Mr. Frank W. Frueauff, as vice-president and general manager of the Denver Gas & Electric Company. The latter has entered the firm of Henry L. Doherty & Company, of New York, N. Y.

MR. L. H. KIDDER, formerly of the Westinghouse Electric Manufacturing Company, has severed his connection with that company, and has been appointed superintendent of motive power of the Pittsburg & Butler Street Railway Company and the Butler Passenger Railway Company.

MR. O. F. FRENCH, formerly general manager of the Cuyahoga Telephone Company, of Cleveland, Ohio, has been appointed deputy minister of telephones, telegraphs and railways for the Province of Manitoba. He will direct the construction of municipal and government owned telephone lines.

PRESIDENT L. F. LOREE and General Manager C. S. Sims, of the Delaware & Hudson, have been elected as president and vice-president, respectively, of the United Traction & Hudson Valley Railway Companies. Abel I. Culver has formally retired as president and general manager of the Delaware & Hudson.

MR. JOHN POWERS, superintendent and electrical engineer of the Sterling, Dixon & Eastern Electric Railway Company, of Sterling, Ill., has resigned to accept a position with the Milwaukee Electric Railway & Light Company, of Milwaukee, Wis. Mr. Powers on leaving Sterling was presented by his associates in business with a handsome Masonic watch charm as a token of esteem.

MR. FREDERICK W. HILL has been appointed assistant general manager and chief engineer of the Havana Electric Railway Company, of Havana, Cuba. Mr. Hill was formerly construction engineer for the General Electric Company in charge of the installation of the machinery for the Aurora, Elgin & Chicago Railway Company, and more recently has been chief engineer of the Southwestern Wisconsin Railway, with headquarters at Dubuque, Iowa.

MR. FRANK W. PARDEE has resigned his position with Frank B. Cook to become treasurer of the Durant Electric Supplies Company, handling telephone and electric material at 56 Fifth Avenue, Chicago. Mr. Pardee has been connected with the telephone and electrical business for about seven years and in that time has made many friends in the electrical field. He was closely identified with Frank B. Cook's business and saw it grow from a comparatively small beginning to its present large proportions. He had charge of salesmen and advertising, and is therefore well fitted to assume his new position with the company in which he is interested.

MR. G. U. G. HOLMAN.—Our readers will be interested to learn that Mr. G. U. G. Holman has been appointed manager of the electrical department of the Boston branch of the H. W. Johns-Manville Company, and has already entered upon his new work. Mr. Holman is well known in electrical circles. After graduating from the Massachusetts Institute of Technology, he was for several years with the Thomson-Houston and General Electric companies in Lynn, Mass., New York City and also in Minnesota. He left the General Electric Company in 1892 to become railway engineer with the Mather Electric Company of Manchester, Conn., and later was engaged in the lighting field in Philadelphia for five years. In the last few years, he has been connected with the construction and operation of electrical enterprises in New York, Philadelphia and Canada, so that he is conspicuously qualified to make the most of the opportunities offered him in his new field.

Trade Publications.

SCALES.—A 280-page catalogue issued by John Chatillon & Sons, 85 Cliff Street, New York, illustrates and gives the prices of weighing scales of all types for all purposes.

OIL-SWITCHES.—The Hartman Circuit Breaker Company, Mansfield, Ohio, has issued Bulletin No. 8, devoted to oil-switches for wall mounting and distant manual control.

FUSES.—Electric protective devices for any e. m. f. from 110 to 10,000 volts and for currents ranging from .25 ampere to 600 amperes are treated in the latest catalogue and price-list of the Sachs Company, Hartford, Conn.

COOLING TOWERS.—Catalogue No. 7 of the Alberger Condenser Company, 95 Liberty Street, New York, is devoted to a discussion of the application and advantages of cooling towers where the water supply is limited.

ALLIS-CHALMERS COMPANY, of Milwaukee, Wis., has issued Bulletin No. 1058, devoted to an illustrated description of the Winona Suburban Railway, Indiana, which it equipped with power plant, motor cars, air brakes, etc.

CEMENT-MAKING MACHINERY.—Catalogue No. 7 of the Power & Mining Machinery Company, Milwaukee, Wis., treats at great length the constructional features of machinery for the production of Portland cement by either the wet or the dry process.

STEAM ENGINES.—Bulletin No. 101 of the Lane & Bodley Company, Cincinnati, Ohio, discusses the 4-valve type of shaft-governor engines designed especially for direct connection to electric generators. These engines are built for ratings of from 46-hp to 910-hp.

FLAMING ARC LAMPS.—In a folder issued by the Helios Manufacturing Company, Bridesburg, Philadelphia, it is stated that two flaming arc lamps can replace five carbon arc lamps consuming the same power, thus saving 60 per cent of the cost for energy.

FERRACUTE MACHINE COMPANY, of Bridgeton, N. J., has issued a "temporary" catalogue No. 15. It includes a number of its more recent presses. The new catalogue it is getting out will be very complete, but will not be ready for several months to come.

DIRECT-CURRENT MACHINERY.—The Mechanical Appliance Company, Milwaukee, Wis., describes and illustrates 4-pole direct-current motors and generators. The machines are designed for numerous special applications, and vary in rating from .125-hp to 5-hp.

WOOD PRESERVATION.—The Carbolineum Wood Preserving Company, of 349 Broadway, New York City, has issued a new edition of its catalogue on wood preservation and its avenarius carbolineum as a protection against rot and decay. Copies can be had on application.

VALVE TROUBLES.—Under the title "Valve Troubles and How to Avoid Them," Jenkins Bros., 71 John Street, New York, have issued a handy little brochure devoted to a discussion of this topic and of their own globe and other valves by which troubles are minimized and obviated.

W. R. OSTRANDER & CO., 22 Dey Street, New York City, have issued a timely little pamphlet bulletin on electric fans in buff paper cover, accompanied by a discount sheet applying to this 1907 catalogue. Some 19 fans and outfits are enumerated as well as materials and accessory appliances.

ELECTRIC LOCOMOTIVES.—The Jeffrey Manufacturing Company, Columbus, Ohio, has just issued Bulletin No. 12 in very handsome square quarto form. It is by Mr. F. L. Sessions and is devoted to its electric mine locomotives. There are 80 pages of cuts and text, and the reading matter is admirable.

METALLIC PACKING.—The Bridgeport Metallic Packing Company, Bridgeport, Conn., has issued a pamphlet description of its line of Low metallic packings, the motto of which is "Never Cut, Always Hold." One of the uses for which this packing is particularly recommended is for outside packed plunger pumps.

PLATING APPARATUS.—The Zucker, Levett & Loeb Company, New York, has issued a bulletin giving directions for operating its revolving plating apparatus, for use with solutions depositing copper, brass, bronze, nickel or zinc. The apparatus is furnished ready to connect to the source of electricity.

THE ELECTRIC STORAGE BATTERY COMPANY, of Philadelphia, has just issued the tenth edition of its price list "X," which describes its Exide type of battery in electric vehicle and sparking service. Copy of this price list will be forwarded upon application to any of the company's sales offices or Exide depots.

FEED-WATER MACHINERY.—The Hoppes Manufacturing Company, Springfield, Ohio, has issued a catalogue showing its live-steam feed-water purifiers, exhaust steam feed-water heaters and purifiers, oil eliminators, steam separators and exhaust heads. The catalogue is well illustrated, the cover being embossed in old ivory.

BLOWERS AND FANS.—Catalogue No. 135 of the B. F. Sturtevant Company, Boston, Mass., describes briefly blowers, engines, motors, generating sets, economizers, steam heating apparatus, forges, exhaust heads and other products. Catalogue No. 145 of the same company treats in detail of steel-plate fans for steam engine or electric motor driving.

CHASE-SHAWMUT.—The Chase-Shawmut Company, Newburyport, Mass., has just received from the hands of the printers, circulars and miniature bulletins covering some of its special lines, of which the following is a list: Shawmut ground connection clamps, extended terminal fuses, pocket test lamps, Boston cable clips, red E solder paste, porcelain cutout blocks.

FUSE MATERIAL.—The Chicago Fuse Wire & Manufacturing Company, 170 Clinton Street, Chicago, has just issued its new catalogue No. 19, a very complete compilation of trade data on the subject. It covers all enclosed fuses and blocks now made and used, as well as fuse wire and fuse links. A great deal of practical information is presented, and for reference nothing handier could be desired. A copy of the catalogue will be sent on request.

ELECTRICAL SUPPLIES.—The Trumbull Electric Mfg. Company, makers of electrical supplies, has issued Vol. 1, No. 1 of a so-called magazinette with the title of "Trumbull Cheer," containing "nothing but a collection of floating humors that drift around and have been tossed into print." Incidentally, however, mention is made of a few switches and switch-boxes, while the reader is told that "'Order' is Heaven's first law. Remember that and send us one."

CONDULETS.—Crouse-Hinds Company, Syracuse, N. Y., has issued two admirable publications devoted to its new specialty, "Condulets," comprising a full line of conduit outlet boxes and fittings. One of these pamphlets is a complete catalogue, with cuts, code words, prices, etc., all carefully and skillfully arranged and giving the fullest data. The other pamphlet is entitled "Just a Few Condulet Suggestions" and contains a large number of excellent, clear drawings that show specific applications of this line of material. There are no fewer than 80 pages of suggestions and ideas, all practical, many of the illustrations indeed being made from actual work done with condulets.

NEW ROCK DRILL CATALOGUE.—An artistically produced catalogue of "Chicago Giant" rock drills and kindred appliances is being sent to the trade by the Chicago Pneumatic Tool Company. The book is printed in colors on superfine paper and contains 96 pages of matter. The text is well written and fully explanatory, and is embellished with half-tone engravings illustrating the "Chicago Giant" drills and views of parts, followed by several pages devoted to rock drill steels and an interesting description of the method of lubrication used, one of the distinguishing features of the drill. Several pages are devoted to Franklin air compressors, another of the company's products, followed by illustrations and descriptions of the "Baby Giant" or "One Man" rock drills, and scenes of work. Catalogue No. 22 is the title of the book. Copies will be forwarded upon request by addressing the Chicago Pneumatic Tool Company, Fisher Building, Chicago, or 95 Liberty Street, New York, N. Y.

LITTLE GIANT POLE RAISER.—The Wiley-Emery Manufacturing Company, Seneca, Kan., has issued an excellent large folder relative to this specialty. The wood is of Washington fir, the gear of iron, consisting of a 20-in. diameter wheel of 100 cogs, running in a 4½-in. diameter wheel of 20 cogs. The grapple hook is of steel. The base is 7 ft. long, made of two pieces, between which, near the center, is placed the staff, to which near the top and on either side is firmly attached the upper ends of two diagonal braces bolted to the base below. Two cross pieces, to give increased strength and firmness, are bolted to the mast and diagonal braces. The gear and 6-in. drum are securely journaled between the mast and diagonal braces. Under and near the ends and across the base are bars of iron turned down at each end of each bar and made sharp to engage the ground or pavement and prevent slipping, when the machine inclines toward the pole in its ascent. Bolted into the mast and diagonal braces, about 6 ft. from the base, are two iron yokes to fit over axle of the light trucks on which the machine is lowered and readily moved from place to place by one man. An inch rope cable is attached to the drum and extended over a pulley, incased in a steel cap at the top of the mast and brought down and made fast to the grapple hook, consisting of a curved beak, to engage the pole or object; on the upper end of its shank is an "L" shaped bracket, at the angle of which is journaled a pulley to which the cable is ordinarily attached, or it may be carried through and made fast near the top of the mast to double the power. A chain is attached to the free end of the grapple showing the machine at work on green chestnut 65-ft. poles, weight 3000, in common use in many localities, and difficult to handle. The machine will raise a pole two and one-half times the length of the mast at one setting, and a longer one by forcing the base nearer the pole when well up and by blocking the pole and resetting. If additional ease and power is required, bring the cable through the pulley at the top of the hook and fasten near the top of the mast. The circular illustrates the appliances and cites a number of testimonials as to its utility.

Business Notes.

MR. V. C. GILPIN, 120 Liberty Street, New York City, has taken the agency for the Alphaduct Company for New Jersey, New York and eastern Pennsylvania,

THE DIAMOND RUBBER COMPANY, of Akron, Ohio, has arranged to begin the manufacture of insulated wire for electrical purposes, and the necessary machinery has been ordered.

SPLITDORF FACTORY.—The Splitdorf Laboratory of Mr. C. F. Splitdorf, has removed its factory from 17-27 Vandewater Street, New York, to 261-265 Walton Avenue, corner of One Hundred and Thirty-Eighth Street, Borough of the Bronx, where all future communications should be sent.

J. L. SCHUREMAN COMPANY, Chicago, manufacturers of armature motor controlling devices, has opened an office at 92 Chambers street, New York City, and has placed Mr. John C. Terry in charge. Mr. Terry has spent several years in the electrical and elevator business, having been in the employ of the Otis Elevator and Westinghouse Companies for some time.

THE SPRAGUE ELECTRIC COMPANY, of New York City, has opened a district office in the Hennen Building, New Orleans, under the management of Mr. F. V. L. Smith, lately chief inspector of the Louisiana Bureau of Fire Prevention, which will cover the territory included in the States of South Carolina, Florida, Alabama, Georgia, Tennessee, Mississippi, Louisiana, Arkansas, Texas, Oklahoma and Indian Territory.

DODGE & DAY, engineers and constructors, whose main offices are in the Drexel Building, Philadelphia, have extended their business by opening an office in the United States Realty Building, 111 Broadway, New York, which has been placed in charge of Mr. Robert T. Lozier, who has for some years past been prominently connected with electrical industries. The new office has already closed contracts for several industrial and public utility plants.

THE WEINSHEIMER COMPANY, recently incorporated in Chicago, with offices in the Monadnock Block, announces that it has taken the agencies from the Condit Electrical Manufacturing Company for circuit-breakers and oil switches; from Machado & Roller for Whitney electrical instruments; from the Leeds & Northrup Company for electrical measuring instruments, and from the Duncan Electrical Manufacturing Company for integrating wattmeters. This is the company of which W. E. Weinsheimer is president; P. R. Fisher, vice-president, and E. Switzer, secretary and treasurer.

THE WESCO SUPPLY COMPANY, of Ft. Worth, Tex., and St. Louis, Mo., importers and jobbers of electrical machinery and supplies, announces the establishment of a new branch office at Birmingham, Ala., in charge of Mr. W. W. Moore, electrical engineer, who for several years has managed the apparatus department of the company, with headquarters at St. Louis. Mr. Moore is a native of the South and a very capable and well posted man in this particular branch of the electrical business. His wide acquaintance and many friends in that section assure the company an extensive and profitable patronage through their newly established office.

THE WESTERN ELECTRIC COMPANY has put in at 230 Lee Street, Atlanta, Ga., a complete stock of general electrical supplies, and at that point had established a supply organization to care for the Southeastern trade. The company recently completed the construction of its Atlanta plant, which is located on the Central of Georgia Railway, only a few moments' ride from the center of the city. The building has an available floor space of 60,000 square feet. With its side-tracks and modern interior equipment, the plant is peculiarly well adapted for the rapid and economical handling of the heavy stock which is to be carried. Mr. O. D. Street is manager of the Atlanta office.

ELECTRIC SERVICE SUPPLIES COMPANY.—Mr. Willis V. Sweeten, formerly of the Elmer P. Morris Company, 51 Dey Street, New York City, is now connected with the Electric Service Supplies Company. Mr. Sweeten will travel through New York State, making his headquarters at the office of the Electric Service Company, No. 2 Rector Street, New York City. Mr. F. C. Peck, formerly real estate agent for the Delaware & Hudson Railroad Company, is now connected with the Electric Service Supplies Company in Philadelphia, covering the Philadelphia trade. Mr. T. F. McKenna, who for some years has been traveling for Machado & Roller, of New York City, has recently changed his position, and is now traveling in Pennsylvania for the Electric Service Company, making his headquarters at the Mayer & Englund Department in Philadelphia.

OILING PLANTS.—White Star continuous oiling systems, which mechanically keep engine bearings supplied with a steady stream of pure lubricating oil, have recently been installed by the Pittsburgh Gage & Supply Company, Pittsburgh, Pa., in the power plants of the following concerns: Windsor, Essex & L. S. Rapid Railway Company, Kingsville, Ont.; Buick Motor Company, Flint, Mich.; Warwick Mills, Centerville, R. I.; Fitchburg Yarn Company, Fitchburg, Mass.; Kaufmann Bros., Cincinnati, O.; Washington Electric L. & P. Company, Washington, Pa.; Federal Furnace Company, Chicago, Ill.; American Wood Working Machine Company, Rochester, N. Y.; Utica Knitting Company, Utica, N. Y.; Harrisburg Light, Heat and Power Company, Harrisburg, Pa.; Baldwin Locomotive Works, Philadelphia, Pa.; Ames Iron Works, Philadelphia, Pa.; R. A. Long Building, Kansas City, Mo.; Reo Motor Car Company, Lansing, Mich.

ARMSTRONG-KRELING MACHINERY COMPANY.—Messrs. L. D. Armstrong and William M. Kreling have returned to San Francsico and organized a new company under the name of Armstrong-Kreling Machinery Company, with offices at 88 Second Street, that city. They have secured the agencies for the following named products: Marine Engine & Machine Company's Groshon high duty compound crank and fly wheel pumping engine, Burke Electric Company's belted and direct connected three wire direct-current generators, Rollins engines, Erieco engines, Oswego-McNaull water tube boilers, Epping-Carpenter steam pumps and condensers, Golden-Anderson valve specialties. Mr. L. D. Armstrong was formerly chief salesman for Charles C. Moore & Company of San Francisco, and has a large acquaintance all along the Pacific Coast.

A DUSTLESS SWEEPING COMPOUND.—The H. W. Johns-Manville Company has acquired the exclusive sales agency for "Perolin" throughout the United States. This specialty is employed to lay and absorb dust and dirt in public buildings, stores, factories, power plants, etc. The most common method is to use wet sawdust, or sawdust, sand or salt mixed with crude oil or kerosene. All of these are ineffective—most of them highly combustible and, instead of cleaning the floors, leave them in an unsatisfactory condition. Wet sawdust to a certain extent allays the dust, but it leaves the floor muddy. Oily compounds assist in laying dust, but leave the floors, carpets and rugs soiled. Oiled floors are condemned by the Fire Insurance Underwriters' Association because of the added fire hazard. "Perolin" instead of laying the dust, absorbs it. It draws the dust from cracks and crevices in the floors and from carpets and rugs. It is also a powerful disinfectant, leaving the air pure and wholesome and the floor absolutely clean.

Weekly Record of Electrical Patents.

UNITED STATES PATENTS ISSUED MAY 28, 1907.

[Conducted by Rosenbaum & Stockbridge, Pat. Attys., 41 Park Row, N. Y.]

854,709. ELECTRICAL MEASURING INSTRUMENT; Joseph Abrahamson, Detroit Mich. App. filed Aug. 27, 1906. A small current tester or ammeter having a spiral coil with a pivoted magnet encircling the same.

854,717. DYNAMO ELECTRIC MACHINE; Walter M. Coffman, Madison, Wis. App. filed Sept. 5, 1905. Armature construction in which a core is formed of laminated material in sections separated by spaces with separators of special construction between adjacent sections.

854,721. MOTOR CONTROL; Maxwell W. Day, Schenectady, N. Y. App. filed Oct. 15, 1906. Consists in deriving from a constant potential source two interdepending voltages and varying the two voltages simultaneously but oppositely.

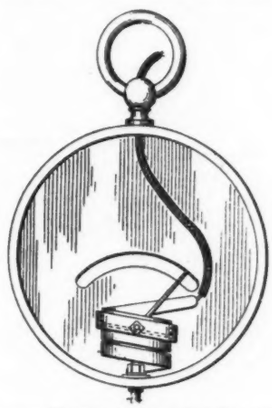
854,723. THERMAL CUT-OUT; John T. H. Dempster, Schenectady, N. Y. App. filed Nov. 7, 1904. The fuse wire extends through a tubular insulating support having spaced iron washers which serve to quickly condense the gases of fusion.

854,724. THERMAL CUT-OUT; John T. H. Dempster, Schenectady, N. Y. App. filed Nov. 7, 1904. A modification of the above, in which the fuse wire is guided in a zigzag path through the washers.

854,727. DEVICE FOR CONTROLLING ELECTRIC CURRENTS; Henry B. Emerson and George H. Dorgeloh, Schenectady, N. Y. App. filed Oct. 3, 1906. A starting resistance having a controlling arm biased to the starting position and means whereby a direct resistance is applied simultaneously with the de-energization of the no-voltage magnet.

854,730. CONTROL OF ELECTRIC CARS; John J. Frank and Jesse S. Pevear, Schenectady, N. Y. App. filed Sept. 19, 1906. A small transformer has its primary in shunt with the motor circuit and serves to automatically make the proper motor connections when the car passes from a direct current section to an alternating current section and vice versa.

854,739. ALTERNATING CURRENT MOTOR; Laurence A. Hawkins, Schenectady, N. Y. App. filed Sept. 10, 1906. In an alternating-current motor, a primary winding, a secondary winding comprising



854,709—Electrical Measuring Instrument.

independent coils relatively rotatable with respect to the primary winding, a magnetic circuit arranged to shunt the primary flux away from a portion of said coils, and independent cross-magnetizing coils connected in series with the several secondary coils.

854,741. REVERSE PHASE RELAY; Edward M. Hewlett, Schenectady, N. Y. App. filed May 4, 1905. A reverse phase relay of simple construction adapted to interrupt the motor circuit in case of reversal of the phase in the main circuit.

854,743. MOTOR CONTROL DEVICE; Andrew Kidd, Jr., Schenectady, N. Y. App. filed July 25, 1906. Means by which a motor is brought to running speed by cutting out the armature resistance and the speed then varied by the variations of the field resistance.

854,748. RESISTANCE UNIT; Frederick Mackintosh, Schenectady, N. Y. App. filed June 11, 1906. A resistance element comprising zig-zag wire clamped into compact form between washers having parallel grooves.

854,749. POWER TRANSMISSION MECHANISM; Campbell Macmillan, Schenectady, N. Y. App. filed Dec. 1, 1905. A power transmitter of the type having a dynamo driving a motor and the circuits controllable. Both motors are made of the uni-polar type so as to avoid commutation troubles.

854,751. CUT-OUT; John T. Marshall, Metuchen, N. J. App. filed June 26, 1905. A cut-out of the type having a pair of spring blades separated by a film of insulating material which breaks down in case of excessive potential difference betweeen the blades. Relates to features of construction by which adequate insulation is secured.

854,756. DYNAMO-ELECTRIC MACHINE; Jacob E. Noeggerath, Schenectady, N. Y. App. filed Mar. 30, 1904. In a dynamo-electric machine, a "homopolar" field structure, and a revolving armature slotted perpendicularly to the axis, the slots being of varying depth.

854,759. TROLLEY POLE; Lee Radcliff, Danvers, Ill. App. filed June 29, 1906. A bow-shaped pole is hinged at its middle portion on the roof of the car and a trolley wheel at either end may be impelled upward against the wire by spring pressed arms.

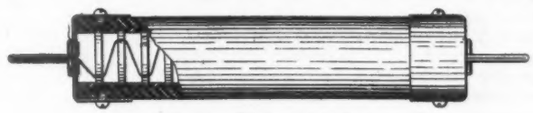
854,760. INDUCTION MOTOR; Henry G. Reist, Schenectady, N. Y. App. filed Sept. 11, 1906. Construction of squirrel cage for alternating current generators in which the conductors pass through perforations in laminations which have a surrounding boss or bead to press the laminations apart.

854,764. THREE-PHASE CURRENT ARC-LAMP; G. Semenza, Milan, Italy. App. filed October 25, 1902. In an electric arc lamp, the combination of a plurality of electrodes, converging toward each other, each electrode being mainly cylindrical but having a flat side of less width than the maximum diameter of the electrode.

854,772. REVERSING THE POLARITY OF DYNAMO ELECTRIC MACHINES; John B. Taylor, Schenectady, N. Y. App. filed Sept. 29, 1904. A method of changing the polarity of self-acting synchronous machines such as rotary converters. Provides means for reversing the field connections of the machine and by suitable manipulation producing the change of polarity desired.

854,773. EQUALIZING LOADS ON MOTOR GENERATOR SETS; John B. Taylor, Schenectady, N. Y. App. filed Oct. 11, 1904. The combination of an alternating current supply system, dynamo electric machines driven therefrom in synchronism, and means for adjusting the phase of one machine with respect to another.

854,774. HIGH-VOLTAGE TRANSFORMER; J. B. Taylor, Schenectady, N. Y. App. filed Oct. 10, 1906. In a transformer, a high



854,724—Thermal Cut-Out.

voltage winding having a greater effective cross-section near its terminals than near its center.

854,777. ELECTRIC METER; Elihu Thomson, Swampscott, Mass. App. filed Apr. 21, 1902. The meter shaft has a switch arm actuated thereby and a pair of motor coils each adapted to have its circuit made and broken by said switch arm.

853,780. COMBINED ANNUNCIATOR AND RINGER FOR TELEPHONE LINES; Henry Tideman, Menominee, Mich. App. filed June 16, 1905. Relates to details of construction.

854,781. COMMUTATOR; Louis E. Underwood, Lynn, Mass. App. filed Aug. 9, 1905. Construction of commutator having copper segments located between flanged heads.

854,782. DYNAMO ELECTRIC MACHINE; Louis E. Underwood, Lynn, Mass. App. filed Oct. 24, 1906. In order to produce a symmetrical exterior appearance the poles of the field magnets are deflected laterally so that a space is made for the commutator within the motor frame.

854,784. DYNAMO ELECTRIC MACHINE; John B. Wiard, Lynn, Mass. App. filed Aug. 10, 1906. A means for constructing dynamo electric machines with distributed winding whereby the connections may be changed in a simple and expeditious manner.

854,790. PIVOTALLY MOUNTED MEMBER; Christian Aalborg, Wilkinsburg, Pa. App. filed May 2, 1906. Mechanical features of construction of a circuit breaker having removable carbon blocks across which the arc is taken.

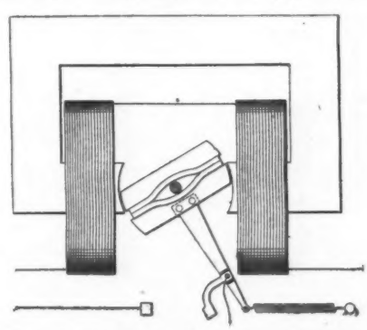
854,804. TROLLEY WHEEL; John C. Cordrey, La Junta, Col., and Patrick J. Brady, Harvey, Ill. App. filed June 30, 1906. A sectional trolley wheel made of steel and brass so as to combine the wear resisting materials of the first metal with the good conducting qualities of the second.

854,813. WIRELESS TELEGRAPH SYSTEM; H. H. C. Dunwoody, Washington, D. C. App. filed Apr. 30, 1906. A wave responsive device comprising a concrete mass or body of magnetite.

854,817. FLEXIBLE ELECTRIC CONNECTION FOR STORAGE BATTERIES; Bruce Ford, Philadelphia, Pa. App. filed Sept. 24, 1904. An acid proof flexible connection comprising a conductor having an insulating cover and an enlarged bare end, and a non-corrosive lug cast on to the enlarged end and adjacent portions of the cover.

854,824. ELECTROMAGNETICALLY-ACTUATED DEVICE; Ray P. Jackson, Wilkinsburg, Pa. App. filed Apr. 3, 1905. Provides a device for operating switches and similar mechanism, in which the amount of magnetizing current shall not be less after the device is actuated than is required to actuate the device in the first instance.

854,825. SYSTEM OF ELECTRIC MOTOR CONTROL; Henry D. James, Pittsburg, Pa. App. filed Aug. 2, 1905. Provides means for



854,824—Electromagnetically Operated Device.

preventing the reversal of the current supplied to the motor while any or all of the accelerating switches are closed.

854,827. SUSPENDING DEVICE FOR ELECTRIC ARC LAMPS AND SIMILAR OBJECTS; Ernest Kuhne, New York, N. Y. App. filed Jan. 31, 1907. Relates to a suspending device for arc lamps which is composed of two members each carrying one section of a switch. The construction is such that these members may be readily interlocked and uncoupled at a distance and by such operation the

lamp will be automatically connected or disconnected from circuit.

854,829. POTENTIAL REGULATOR; Edwin Lehr, Wilkinsburg, Pa. App. filed Sept. 20, 1906. An alternating current regulator having a main transformer winding, two small auxiliary windings, and a plurality of intermediate tubes in said auxiliary windings.

854,830. CALL-REGISTER FOR TELEPHONE SYSTEMS; R. H. Manson, Elyria, Ohio. App. filed Oct. 18, 1906. A call register for telephone service having means for directing a signal to the transmitter and means for damping said signal means.

854,831. ALTERNATING-CURRENT APPARATUS; R. D. Mershon, New York, N. Y. App. filed Oct. 31, 1904. The combination with an alternating-current machine and a single-phase circuit connected therewith, of a condenser connected with the primary element of the machine, the connections thereof being at an angle to those of the single-phase circuit, and means for shifting the connections of the condenser, as set forth.

854,834. ELECTRIC HEATER OR RHEOSTAT; Frank C. Newell, Wilkinsburg, Pa. App. filed June 27, 1902. An electric heater having a resistance conductor formed of an alloy of copper, zinc, nickel and ferro-manganese.

854,846. FUSE BOX OF MOLDED INSULATION; Arthur C. Savage, Schenectady, N. Y. App. filed June 12, 1905. Construction of thermal cut-out having an arc, and a polepiece mounted at the side thereof and composed of portions separated by a gap.

854,862. SYSTEM OF ELECTRICAL DISTRIBUTION; Joseph L. Woodbridge, Philadelphia, Pa. App. filed Aug, 29, 1906. A rotary converter for transforming electrical energy from alternating to direct current.

854,866. MAIL CHUTE; Robert W. Ashley, New York, N. Y. App. filed Dec. 23, 1905. Provides means for locking and unlocking the slots of a mail chute so that in case of stoppage thereof the insertion of mail may be interrupted.

854,881. PORTABLE TEST METER; Christian H. Evers, Birmingham, Ala. App. filed Nov. 23, 1905. Provides means for promptly bringing a meter to the proper temperature condition for accurate testing.

854,802. SYSTEM OF CONTROL FOR ELECTRIC MOTORS; Henry D. James, Pittsburg, Pa. App. filed Oct. 3, 1905. A system of control for electric motors applied to the operation of elevators, machine tools and similar devices.

854,897. ARMATURE FOR DYNAMO ELECTRIC MACHINES; Benjamin G. Lamme, Pittsburg, Pa. App. filed Sept. 20, 1906. Means for ventilating an armature so as to dissipate the heat as readily as possible. The armatures are laminated in spaced sections.

854,918. ELECTRIC GOVERNOR; Herman Weber, Colorado Springs, Col. App. filed Apr. 30, 1906. Relates to automatic signaling devices, and provides means for automatically closing an electric circuit and lighting a lamp or visual signal for the purpose of giving an alarm in case a predetermined speed of an automobile is exceeded.

854,926. ELECTRIC RAILWAY SIGNALLING SYSTEM; Antonio Casale, Scranton, Pa. App. filed June 23, 1906. Provides means whereby the approach of two trains within a danger limit will produce a warning signal in the cab of both trains. Has special trolleys laid alongside the usual track rails.

854,940. PROCESS FOR THE PRODUCTION OF ACTIVE MATTER FOR ACCUMULATORS WITH MIXED OXIDES; H. Fredet, Brignoud, France. App. filed Jan. 2, 1904. The process of making an active material for accumulator plates, which includes the mixing of lead oxide with ammonium hydrosulfid, substantially as described.

854,943. PLATING-SEPARATING DEVICE; Percy Raymond Greist, New Haven, Conn. App. filed Mar. 14, 1907. A piece of wire with eyes formed at right angles to a straight portion.

854,958. COMBINED BURGLAR ALARM AND SASH HOLDER; James M. Montgomery, Berl. W. Va. App. filed June 18, 1906. An improved combination window sash fastener and circuit closing device for burglar alarms. Provides means by which the sash can be held at any adjusted position and give the alarm signal when displaced.

854,965. OZONIZER; Henry Noel Potter, New Rochelle, N. Y. App. filed Jan. 20, 1905. The ozone generator is surrounded with an envelope opaque to ultra-violet rays and presents to the generator a polished or diffusely reflecting surface. Special means are provided for collecting or using the ozone generated.

854,970. ELECTRICAL BLOCK SIGNAL; Elza S. Stotts and Lester O. Dickey, Omaha, Neb. App. filed Aug. 13, 1906. Construction of semaphore having a motor for raising the arm and a magnet trip for dropping it to danger.

854,978. CONNECTION FOR ELECTRICAL SOCKETS AND CONDUITS; Reuben B. Benjamin, Chicago, Ill. App. filed Sept. 19, 1906. Provides means by which conduits for electric wires may be run along the corners of show cases, etc.

854,997. APPARATUS FOR SEPARATING GOLD FROM MAGNETIC SANDS; Elmer Gates, Chevy Chase, Md. App. filed Mar. 19, 1900. An apparatus for separating gold from magnetic sands comprising a feed apron and a magnet having roughened surfaces, and means for imparting to the apron a rapid series of short up and down movements.

855,002. SECONDARY ELECTRIC CLOCK; William S. Guthrie, Terrell, Tex. App. filed July 5, 1906. Improvements in clocks of the type controlled by a master clock. Aims to provide an efficient mechanism for preventing abnormal movement of the hands of the secondary clock under any circumstances.

855,010. ALTERNATING-CURRENT MOTOR; M. C. A. Latour, Paris, France. App. filed June 18, 1904. In combination with an alternating current motor of the commutator type, means for connecting it at the start as a repulsion motor, and means for connecting it as a shunt motor when it is up to speed.

855,046. STARTER FOR BLOWERS; Louis Bertram, Lincoln, England. App. filed Dec. 17, 1904. Relates to motor starters for organs. The starting arm is connected to a pneumatic device which moves it slowly as the pressure increases in the wind chest.

855,060. PROCESS FOR MANUFACTURING INCANDESCENT BODIES FOR ELECTRIC LAMPS; Alexander Just, et al. Budapest, Austria. App. filed July 6, 1905. The method of making incandescent bodies for electric lamps which consists in producing the said body from a mixture of carbon and tungsten.

855,066. MEANS OF CONTROL FOR AN ELECTRICALLY ACTUATED BODY; Benjamin McInnerney, Omaha, Neb. App. filed Apr. 9, 1906. A complete system of control for an electric elevator.

855,085. TELEGRAPH KEY; Benjamin F. Bellows, Cleveland, O. App. filed July 9, 1906. A telegraph key having a vibratory movement in a horizontal plane. Relates to details of construction.

855,093. CONTROLLER FOR ELECTRIC MOTORS; Frederick H. Burmester, St. Louis, Mo. App. filed Feb. 1, 1905. The controller shaft has a switch arm operated thereby which controls solenoids and which in turn operate the reversing means of the motor.

855,114. SUSPENDER FOR THE CONTACT WIRES OF ELECTRIC RAILWAYS; Joseph Mayer, Rutherford, N. J. App. filed Feb. 5, 1907. A suspender for electric trolleys adapted to clamp the wire and protect it from bending strains.

855,117. APPARATUS FOR TESTING TELEPHONE-WIRES; J. M. Miller, et al. Newton Square, Pa. App. filed June 20, 1906. Arrangement of circuit for lineman's testing outfit.

855,147. REVERSING SWITCH; Charles A. Tunstall, Kamloops, British Columbia, Canada. App. filed Dec. 18, 1905. Embodies U-shaped tubes containing mercury through which the circuit is closed.

855,155. ADJUSTABLE OUTLET BOX; Max D. Baron, Borough of Manhattan, New York. App. filed Feb. 24, 1906. Provides an inexpensive box having an outlet opening or receptacle socket possessing a wide range of lateral and rotary adjustability and which shall possess a closed interior for all adjustments of the receptacle opening.

855,157. PROCESS OF REDUCING METALLIC SULFIDS; Frederick M. Becket, Niagara Falls, N. Y. App. filed Mar. 5, 1907. A process for reacting on a metallic sulphide with silicon or one of its compounds. Refers particularly to the reduction of molybdenum and vanadium sulphide ores.

855,158. DEMAGNETIZER; Donald M. Bliss, New York, N. Y. App. filed Mar. 1, 1906. The demagnetizing coil is fixed on a casing containing a construction of vibratory current reverser.

855,166. MAGNETIC ORE SEPARATOR; Edgar A. Edwards, Cincinnati, Ohio. App. filed July 30, 1904. Relates to improvements in separators of the type having an inclined element through which the ore material is fed and where it is exposed to the action of spaced magnetic poles.

855,168. SIGNALING KEY; Oscar F. Forsberg and Jules A. Birsfield, Chicago, Ill. App. filed Oct. 27, 1902. A signaling key for telephone switchboards by which predetermined or code signals are sent over a party line.

855,208. INSULATOR; Herbert Sinclair, Trenton, N. J. App. filed Feb. 19, 1907. A two-part porcelain insulator adapted to clamp the conductor when the sections are screwed in place upon a supporting wall or surface.

855,220. ELECTRIC METER;; Riccardo Arno, Milan, Italy. App. filed Jan. 6, 1906. The method of measuring a variable electric current which consists in causing such current to affect a rotatable member placed within the influence of a rotary magnetic field.

855,221. ELECTROLYTIC DIAPHRAGM AND METHOD OF MAKING SAME; Leo H. Beakeland, Yonkers, N. Y. App. filed Mar. 10, 1906. A base of woven fabric such as asbestos cloth, has applied to it a coating containing an oxide of iron and a binder base. For use especially in the electrolysis of brine.

855,243. INSULATOR-PIN; William S. Lee, Jr., Charlotte, N. C. App. filed Feb. 10, 1906. An insulator pin comprising a hollow conical metal base, and a securing bolt passing through the same, said bolt threaded at its upper end, and a metal head screwed on the upper end of said bolt, said head adapted to be fastened into an insulator and to be unscrewed from the upper end of the bolt to replace a damaged insulator.

855,249. SELF WINDING ELECTRIC CLOCK; Maximillan Juruick. New York, N. Y. App. filed Dec. 10, 1906. An electric clock in which a rotary circuit breaker with a sliding contact is used for closing the circuit at certain intervals of time.

855,261. INSULATOR-PIN; Louis Steinberger, New York, N. Y. App. filed Oct. 9, 1905. An insulator pin, comprising a strengthening member having an enlarged head, and a jacket of insulating material enveloping said strengthening member and provided with an annular thickened portion constituting a head and disposed adjacent to said enlarged head.

855,262. SPIRAL-CORE INSULATOR; Louis Steinberger, New York, N. Y. App. filed June 11, 1906. As an article of manufacture, a member of insulating material provided with ends threaded internally, and a coupling threaded externally and adapted to engage said threads.

855,300. LIGHTNING ARRESTER; William Gifford, Thompsonville, Mich. App. filed Apr. 21, 1906. A lightning arrester comprising an insulating base, resistance elements mounted thereon, a metal rack which secures the elements to the base and is connected with the elements to distribute the electric discharge thereof, and a series of spark gaps secured to the base in cooperative relation to the resistance element.

855,323. STRAIN ADJUSTER FOR CONTACT WIRES OF ELECTRIC RAILWAYS; Joseph Mayer, Rutherford, N. J. App. filed Feb. 5, 1907. Construction of trolley hanger designed to overcome the effects of changes in temperature in the trolley.

855,355. HIGH-POTENTIAL INSULATOR; Louis Steinberger, New York, N. Y. App. filed Sept. 12, 1906. A device of the character described, comprising an insulator body provided with a hood integral therewith, said hood being fashioned at its bottom so as to present oppositely disposed sloping edges terminating in drip joints.

855,365. RELAY; Eugene W. Vogel, Chicago, Ill. App. filed May 20, 1901. Relates to improvements in an interfering relay of the Hovey type.

855,389. ELECTRIC ATTACHMENT FOR MOVABLE OBJECTS; John R. Dawkins, McKinney, Tex. App. filed Feb. 19, 1906. An electric current is passed through a ploughshare in operation so as to prevent the soil from sticking thereto.

855,391. TELEPHONE-SWITCHBOARD; John M. Dosbaugh, Cedar Vale, Kan. App. filed Aug. 1, 1905. Arrangement of busy test signals.

855,394. TELEPHONE; Oscar F. Falk, Boston, Mass. App. filed July 1, 1905. In a hand-set or combination telephone, a handle bar having a receiver at one end and a transformer at its other end, the transmitter including a granular carbon button connected and disposed at an angle to the transmitter diaphragm, whereby contact between the granulated conducting material of the carbon button and its cooperating electrodes will be maintained in all positions which the hand-set may take while in use.

855,395. TELEPHONE TRANSMITTER; Oscar F. Falk, Boston, Mass. App. filed July 2, 1906. Modifications of the above.

855,427. ELECTRIC AND PERCUSSION FIRING MECHANISM; William H. Bevans, Bridgeport, Conn. App. filed May 9, 1904. A firing mechanism for ordnance comprising electric and percussion gears after firing the charge, and operating means whereby a certain movement thereof effects the operation of one of said gears, and a further movement the operation of the other gear.